

AIRCRAFT ENGINES OF THE WORLD

1945

BY

PAUL H. WILKINSON

CONSULTING ENGINEER

Member of the Society of Automotive Engineers
Member of the Institute of the Aeronautical Sciences

Author of
Diesel Aircraft Engines, 1936
Aircraft Diesels, 1940
Aircraft Engines of The World, 1941
Diesel Aviation Engines, 1942
Aircraft Engines of the World, 1944

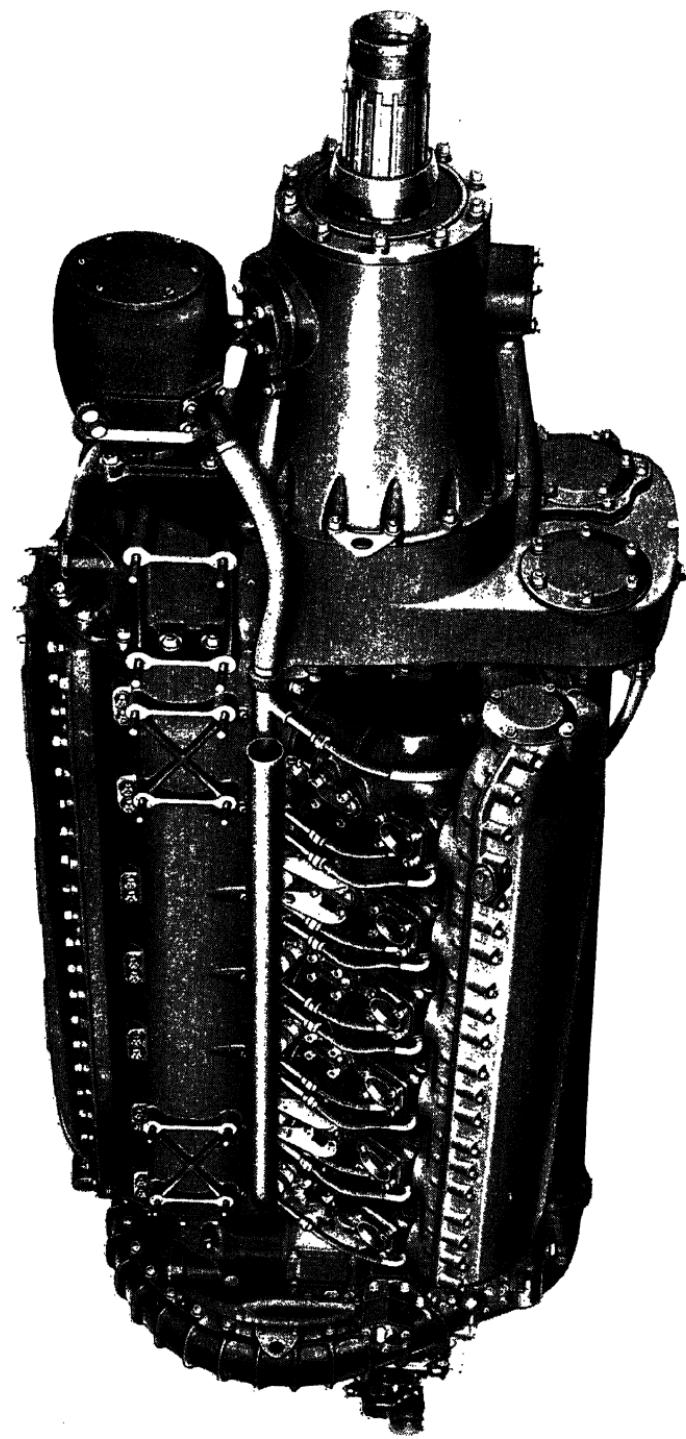
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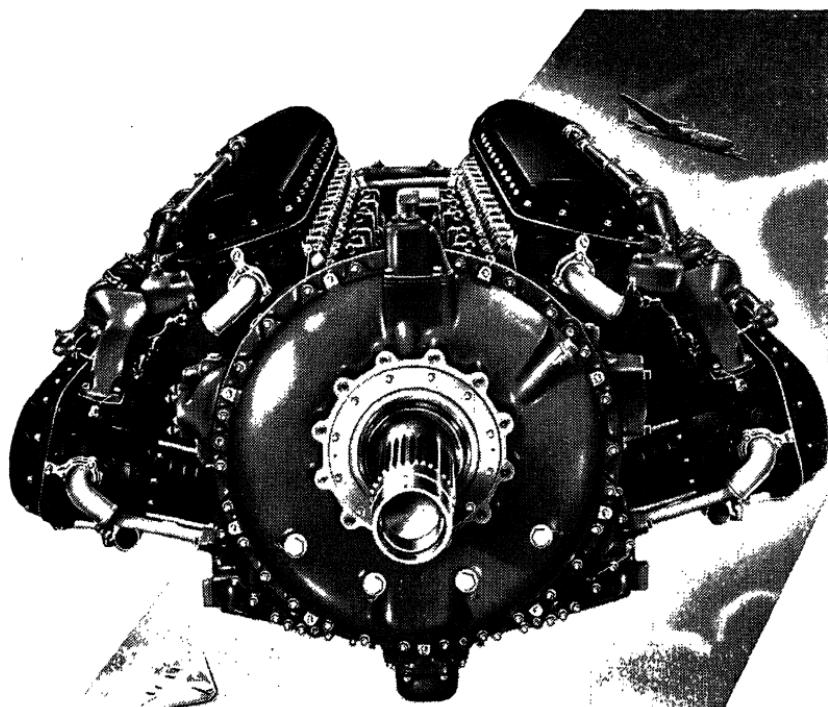
The Continental I-1430 12-Cylinder Liquid-Cooled
Inverted-Vee Engine—United States of America

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THE WORLD'S MOST POWERFUL**

Going into America's new planes is the most powerful liquid-cooled aircraft engine in the world. ★ It is an Allison engine — of approximately 3,000 horsepower.

★ It is more powerful by hundreds of horsepower — gives our pilots over a third more power to work with than the huskiest engine they had before. ★ Virtually all its parts are the same as in other Allisons. So plane crews around the world can service it right now. ★ Its high power, long range, smoothness and dependability are qualities vital in the days of war, and equally important in the planes in which you will fly when peace returns.

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ALLISON**

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P-40—Warhawk
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The more-than-50,000 Allison engines built for the U. S. Army Air Forces power the above planes.

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DIVISION OF

Indianapolis, Indiana



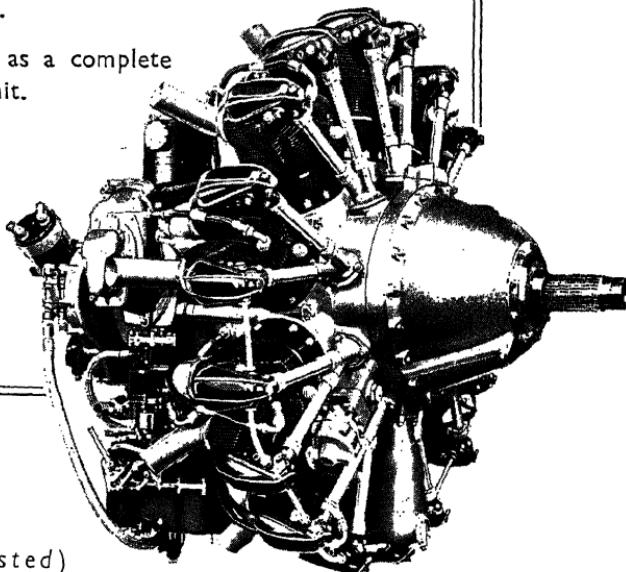
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Fuel Consumption, Maximum Continuous Cruising Conditions (Pts./BHP/HR) 0'60

Type of Oil ... D.T.D. 109

Oil Consumption (Pts. per hr.) 3 to 7

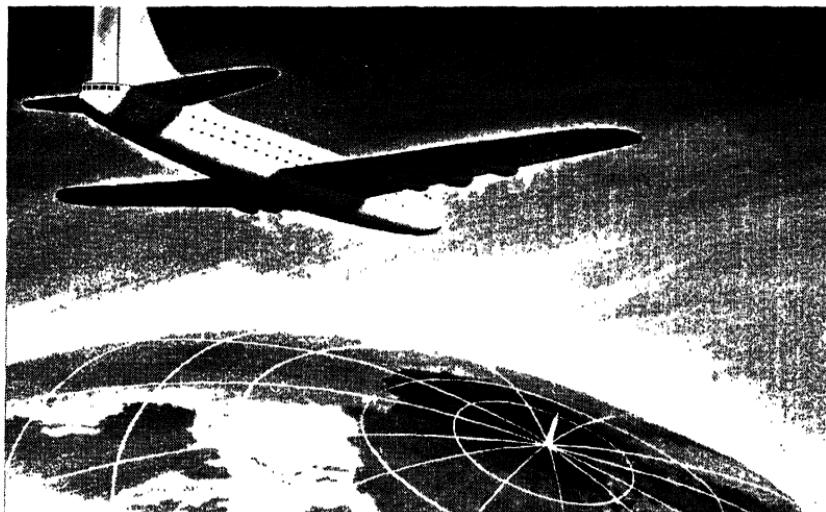
NET DRY WEIGHT (lbs) 708

OVERALL DIAMETER 41 $\frac{1}{2}$ inches

ALVIS

COVENTRY, England.

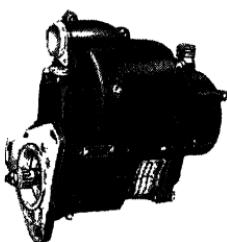
AIRCRAFT INDUSTRY



"SO THAT'S THE NORTH POLE!"

Soon the North Pole will need a marker — adequate identification for the postwar passengers on polar routes who'll want to tell their friends they've really seen it. Meanwhile American Bosch sticks to its war jobs — starting vibrators for positive ignition at all temperatures from equator to the arctic circle — aviation magnetos that have helped modern aircraft engines maintain service ceilings of seven miles and more — gasoline injection equipment that saves fuel, steps up pay load, increases engine performance and round trip military range. Whether the future will demand more and more production for military needs or a rapid changeover to transports for polar and other global routes, in research, design and production, American Bosch will continue to serve all branches of the internal combustion industry.

American Bosch Corporation • Springfield, Mass.



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FOR AIRCRAFT ENGINES**An Aircraft Spark Plug***

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The uniformly good flight characteristics of **B&G** Spark Plugs derive from the fact that they are first and foremost *aircraft* spark plugs. They are manufactured to the close precision standards of the aviation industry and subject to constant research to insure that **B&G** Spark Plugs stay abreast of the engines themselves in design, in construction, in performance.

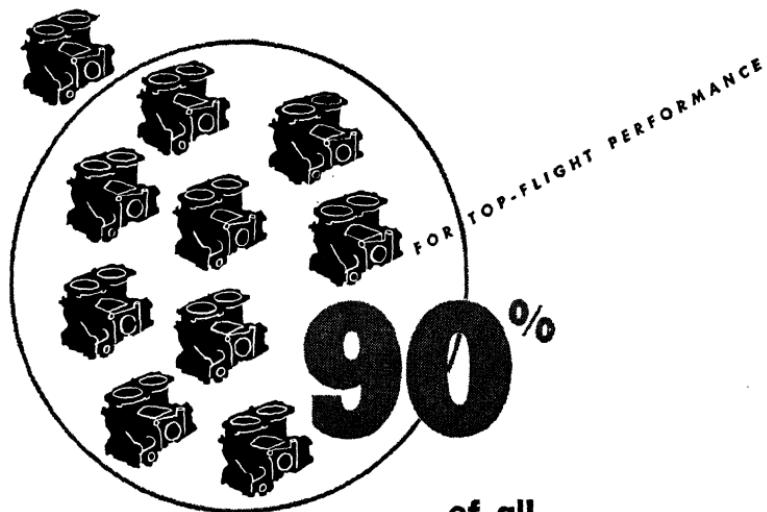


*Ceramic or mica insulated.

**THE B&G CORPORATION**

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Contractors to the United States Army, Navy and Coast Guard and Aircraft Engine Builders



Aircraft Carburetors

built

are made by STROMBERG

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Nor does success in one year guarantee success in the next. The vigilant eyes of the industry keep constant watch. The inferior product is dropped as quickly as its shortcomings are discovered. The good product

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There is, then, in these inflexible statistics, a story of product excellence far beyond the power of mere words to describe.

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Bendix *PRODUCTS DIVISION*

Bendix Aviation Corporation, South Bend 20, Indiana



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Breeze



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name behind the world's finest aero engines.

The world's finest aero engines—this is a sweeping statement, yet when one considers the tremendous contribution made by the famous range of "Bristol" sleeve-valve engines to the war effort, such a claim is justified. To mention a few—Halifax III, Lancaster II, and the Stirling, all are powered by "Bristol" Hercules sleeve-valve engines—a record unsurpassed in the aero-engine field. Meanwhile, the performance of the Hercules in these and other British battle planes justifies the belief that the best engines of peace, too, will be based on the famous "Bristol" single sleeve-valve principle.



558

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Flight

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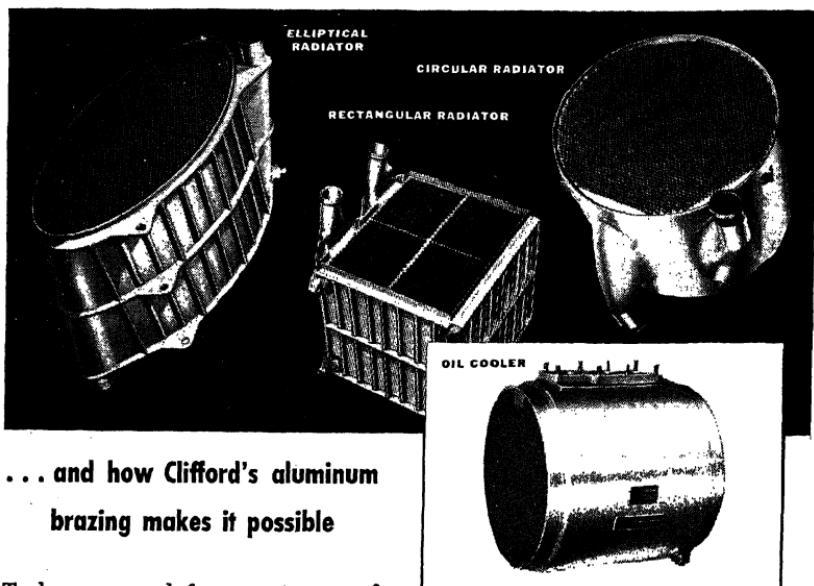
BTH research has contributed much to the efficiency of the air-arm in combat and defence, and especially in the development of Air Commodore Whittle's jet engine, work on which was commenced in the BTH Rugby Factory as early as 1936. The first successful flight of an aeroplane fitted with this engine was in May 1941.

BTH

THE BRITISH THOMSON-HOUSTON CO., LTD.
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IA104

HOW THIN ALUMINUM TUBING IMPROVES HEAT TRANSFER UNITS



... and how Clifford's aluminum
brazing makes it possible

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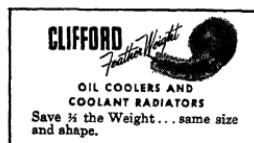
When heat transfer units call for lighter weight and more "guts", men who know specify Hydron seamless aluminum tubing . . . bonded inti-

mately to header plates . . . by all-aluminum alloy . . . brazed by Clifford's exclusive patented method.

For, Clifford Feather-Weight Heat Transfer Units provide, for the first time, greater resistance to temperature, pressure and vibration in elliptical and oblong designs as well as in conventional circular cross-sections.



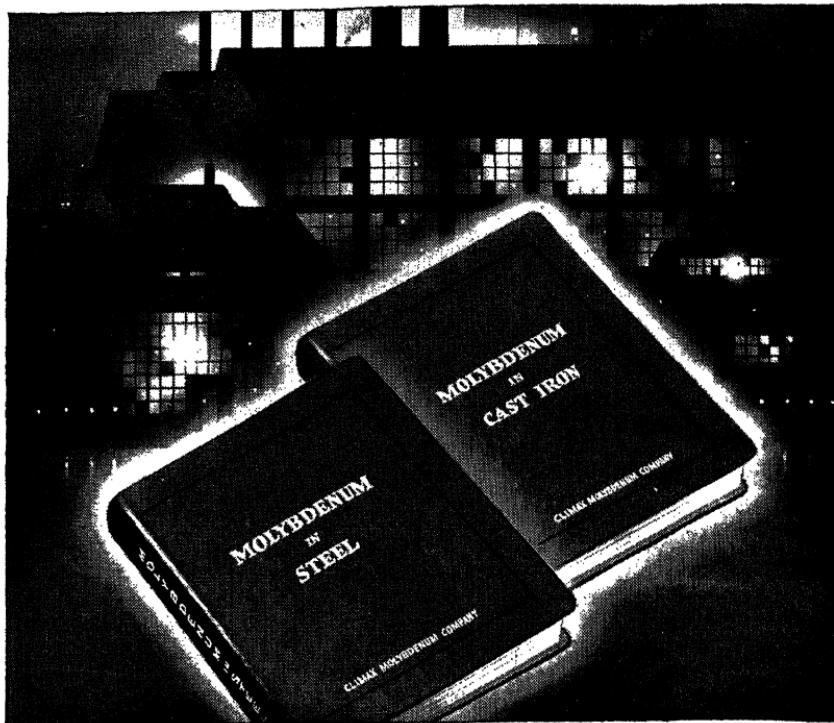
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"MOLYBDENUM IN CAST IRON" covers the effect of Molybdenum in gray iron, giving suggested analyses for practical applications and detailed discussion of high strength (60,000 p.s.i. and up) irons.

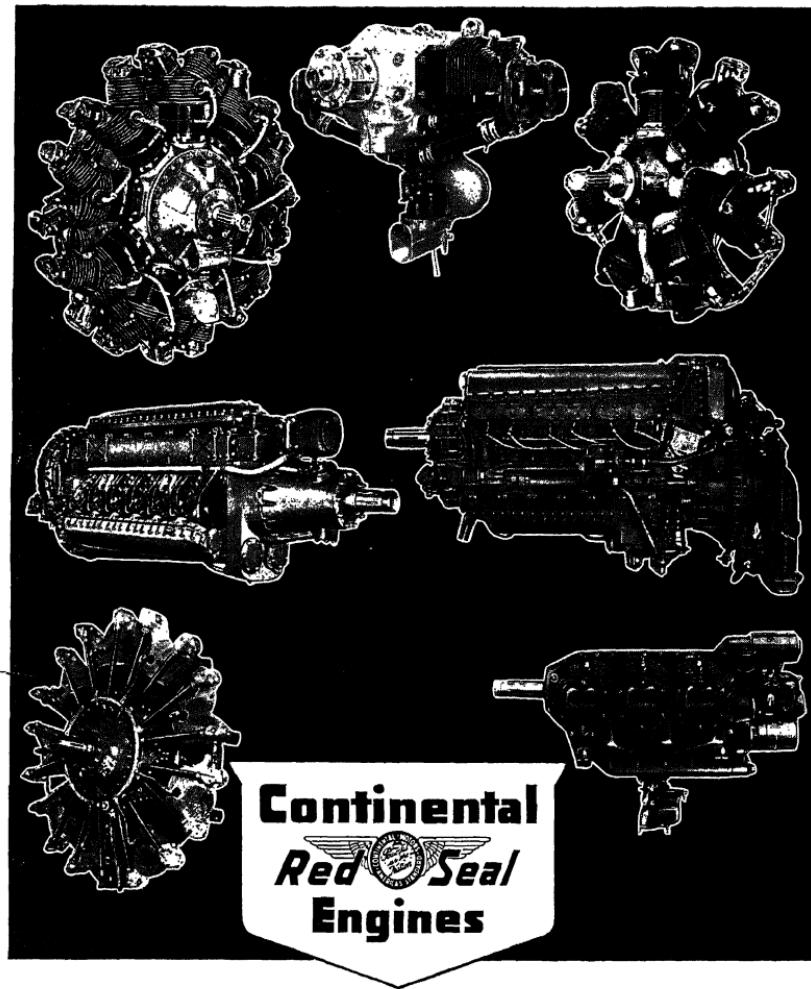
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The complexity of these aircraft engines built by Continental shows an extraordinary ability to produce.

Each model of engine enjoys the advantages of the most modern and efficient equipment for the development of operating characteristics and to prove endurance qualities.

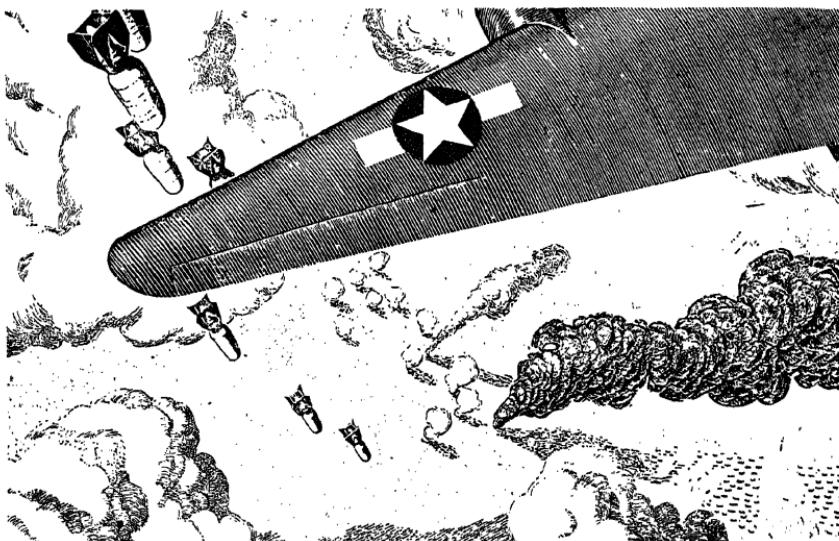
All parts are coordinated to insure the utmost in power, economy, smooth operation and dependability. The final result is called Continental Red Seal Power — the Power to Win.

Your Dollars Are Power, Too!
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Detroit and Muskegon Plants of
Continental Motors Corporation
for High Achievement

Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN



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• Shortly after the first world war, Eaton engineers were working feverishly with a hollow, self-cooling valve that would permit airplane engines to cover long distances at high speed without overheating.

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Eaton considers it a great privilege, as well as a great responsibility, to be so closely associated with the great new American industry that is destined to change the history of the world.

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**PLANTS: CLEVELAND • DETROIT • SAGINAW
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- ★ HYDRAULIC EQUIPMENT
- ★ MISCELLANEOUS ELECTRICAL & MECHANICAL COMPONENTS

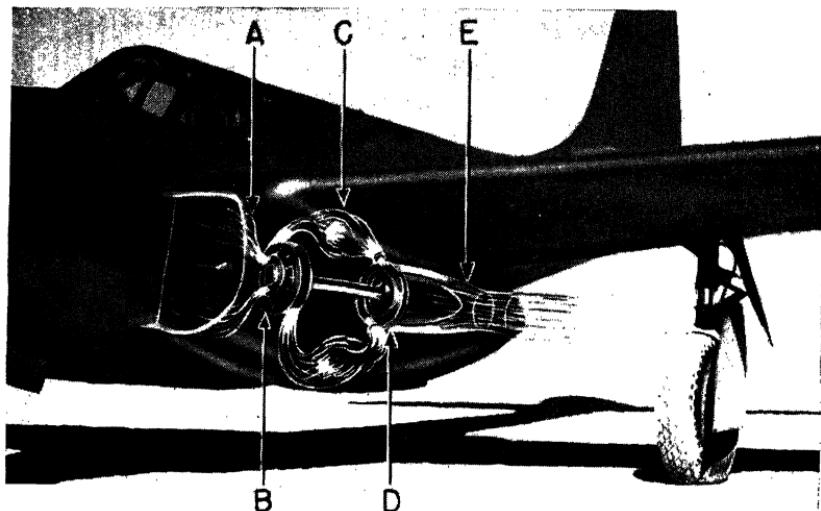


ECLIPSE-PIONEER DIVISION

BENDIX AVIATION CORPORATION, Teterboro, N. J.

G-E JET-PROPULSION ENGINES

Lightning-swift speed and other vitally important advances in performance characteristics have been achieved by propellerless planes powered by the new-type jet engine of revolutionary design which was developed and produced by General Electric.



OPERATION: A. Air flows into intake; B. Air is compressed; C. Compressed air goes to blast chamber, where fuel is ignited and temperature raised; D. Turbine is propelled by gas pressure,

and it in turn gives power to air compressor at front of engine; E. Nozzle through which air flows at high velocity, creating, by reaction, the force which drives the plane forward.

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Amplidyne	Ignition systems
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Automatic pilots	Radio transmitters
D-c generators	Selsyn-operated control systems
	Turbosuperchargers

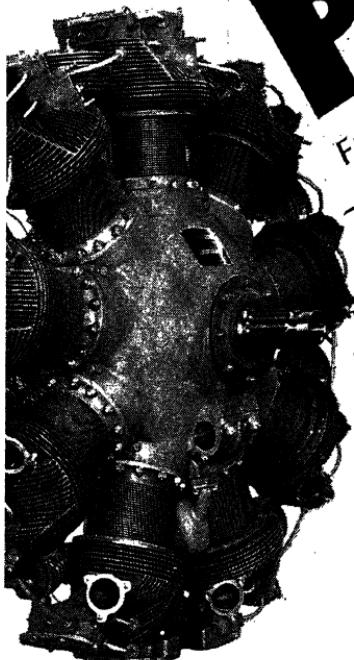
No matter where you are located, there is a G-E representative near you—he'll be glad to serve you in any way he can.
General Electric Company, Schenectady 5, New York.

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1912

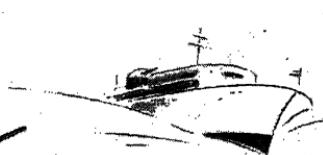
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- ★ LOW FUEL COST
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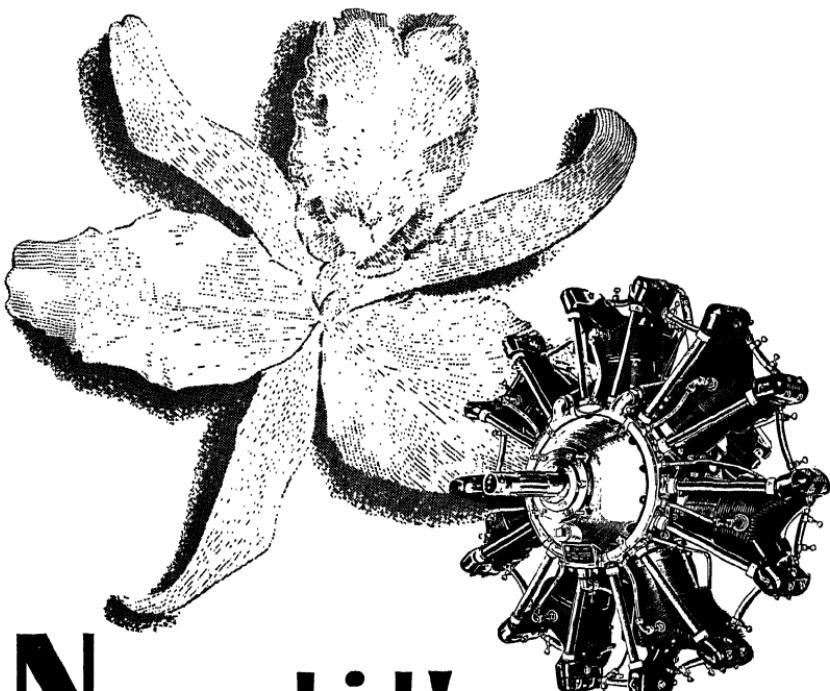
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GUIBERSON

AMERICA'S
RADIAL AIR-COOLED
DIESEL ENGINE



Guiberson U.S.A.

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Dallas, Texas *Aircraft and Heater Division*



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This Jacobs engine is no war baby, hot-house developed at high speed, with cost no object . . . no military matériel headed for future scrap heaps when the show is over!

The Jacobs was born in the twenties, built for pilots who paid for their own engines out of perilous prize money and hard-earned charter hours . . . developed through the Depression years when aviation was in the poorhouse . . . a bread and butter job for ships that had no spares . . . an orphan child on upkeep, but a hog for performance and payload.

When the war broke, the Jacobs was a sure thing in its power class, proven in performance, ripe for quantity production, and

ready for the tough job of toting twin-engine trainers that turn hot pilots into Big Operators.

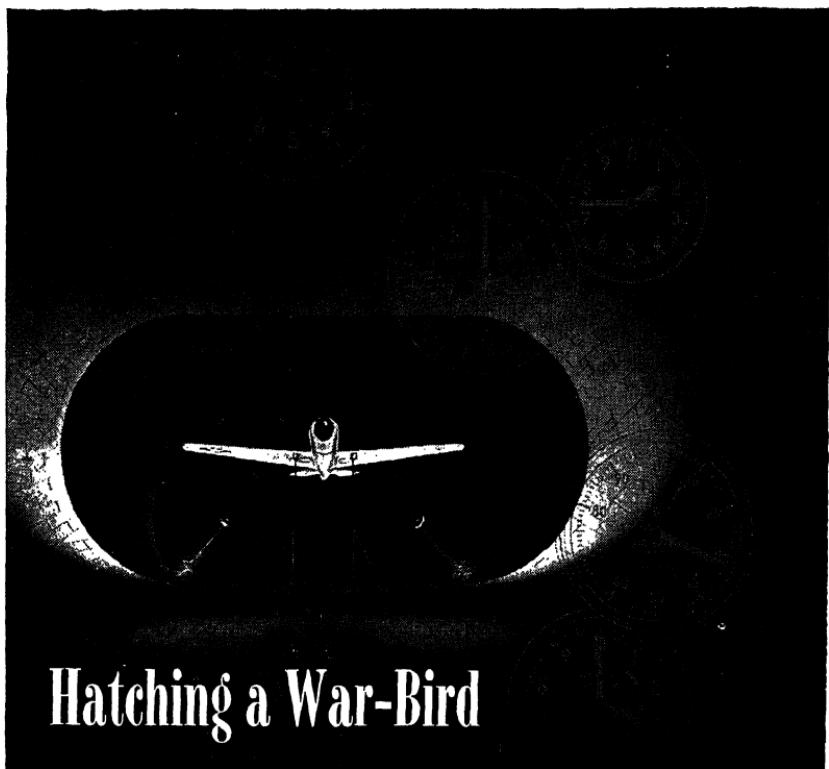
Jacobs engines take more take-offs and more full throttle time than the big radials on combat ships, stand up under student handling, diverse terrain and varied climate . . . and today deliver more than a thousand hours of service between major overhauls—performance that is *three times* the original prescription!

For worry-free, dependable delivery of packaged power at low cost, Jacobs had a lot to offer the war effort . . . will have even more for peacetime aviation and industry. Proof on request . . . Jacobs Aircraft Engine Co., Pottstown, Pa.



JACOBS

• Pottstown, Pa.



Hatching a War-Bird

THE majority of those who use and respect Kollsman aircraft instruments know them most intimately as sentinels on the airplane instrument panel, indispensable to the plane's precise and dependable operation.

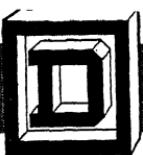
But long before our war-birds ever get into service, many engineers certify their design and performance

with Kollsman instruments in wind tunnels, engine test cells and in test flights.

Because of their accuracy, standard Kollsman instruments are found in frequent use for many forms of aeronautical experiment and in production testing. In addition, many special Kollsman instruments have been developed for these uses.

KOLLSMAN AIRCRAFT INSTRUMENTS

PRODUCT OF



SQUARE D COMPANY

ELMHURST, NEW YORK

GLENDALE, CALIFORNIA

Electricity

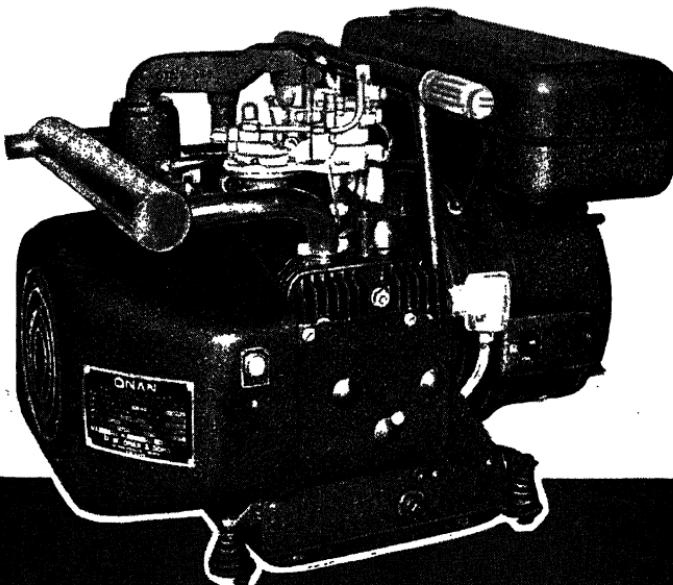
For all
**AVIATION
APPLICATIONS**

ONAN ELECTRIC GENERATING PLANTS provide reliable, economical electric power for many applications in the aviation industry. Available in 65 models including Airborne types. Powered by Onan-built, 4-cycle, gasoline engines, these electric plants are of compact, single-unit design. Built for heavy duty or intermittent service, stationary or mobile. Supply power for starter energizing . . . radio navigation . . . battery charging . . . communications . . . cabin heating . . . airport and general lighting . . . electrical repair tools . . . aircraft accessories . . . many other applications.

350 to 35,000 WATTS

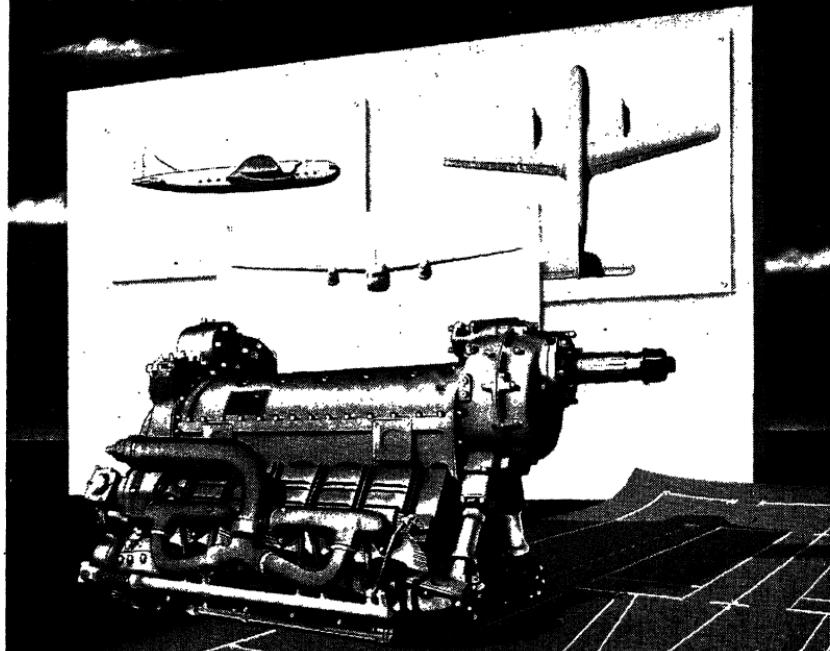


Sizes range from 350 to 35,000 watts. A.C. types of 115 to 660 volts; 50, 60, 180 cycles, single or three phase, and 400, 500 and 800 cycles, single phase; also special frequencies. D.C. types range from 6 to 4,000 volts. Dual voltage types available . . . Write for descriptive literature . . . Model shown is from OTC series.



D.W. ONAN and SONS
3150 ROYALSTON AVE • MINNEAPOLIS, MINN.

THE TOUCH OF TOMORROW IN THE PLANES OF TODAY



INLINE FOR THE AIRLINES

Here in this clean, compact package is power for the airplanes of tomorrow—airplanes that will knit together the world's growing network of airways.

Latest in production of a long line of Ranger engines, the Ranger Twelve is ready to take its place as the efficient power plant for feeder line transports of the new air age.

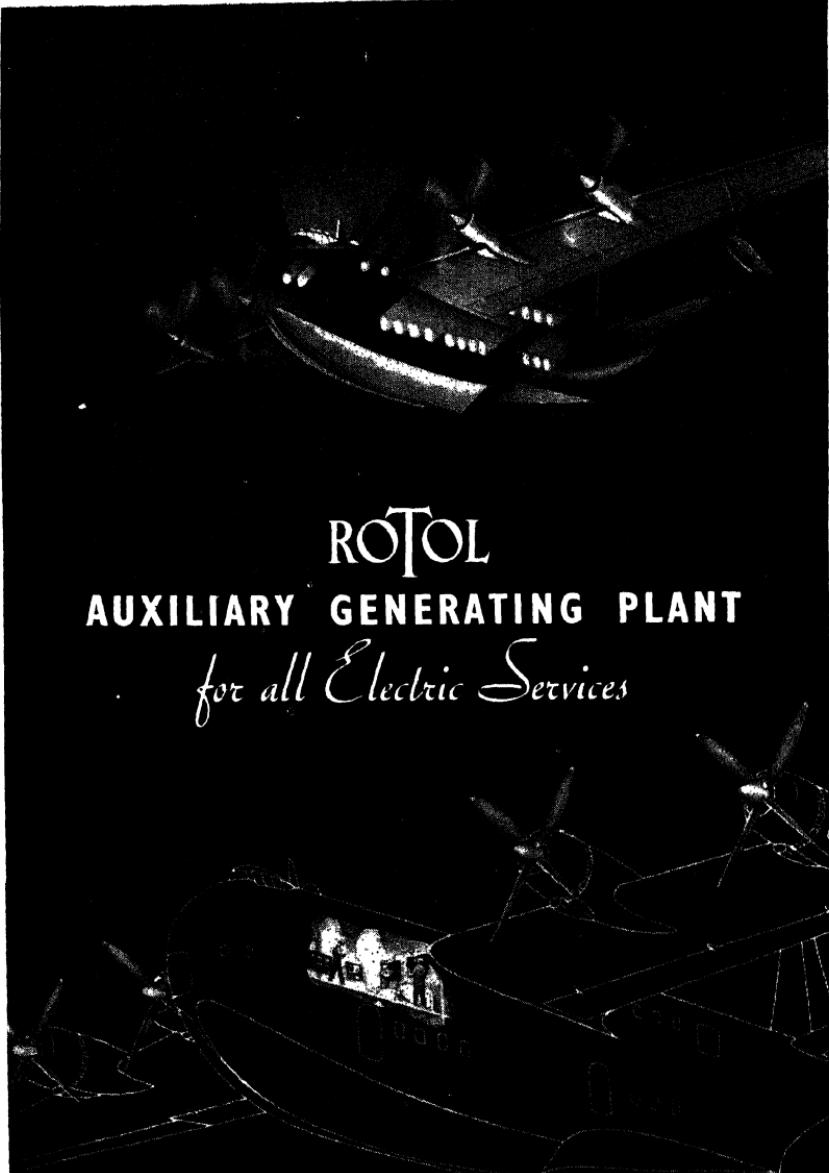
Constantly improved since its inception, Ranger Twelve is backed by fifteen years of Fairchild experience in building aircraft engines. Its dependability is assured by Fairchild precision construction

and a heritage of careful research and engineering skill.

Inline, aircooled, inverted; one of the few truly highspeed aircraft engines in existence, the Ranger Twelve delivers *smooth* power. The simplicity of its design can sharply reduce inspection and maintenance expense.

Within its design, too, lies a promise . . . a promise for even greater efficiency and sleekness in new Rangers to come through that quality built into all Fairchild products, "the touch of tomorrow in the planes of today."

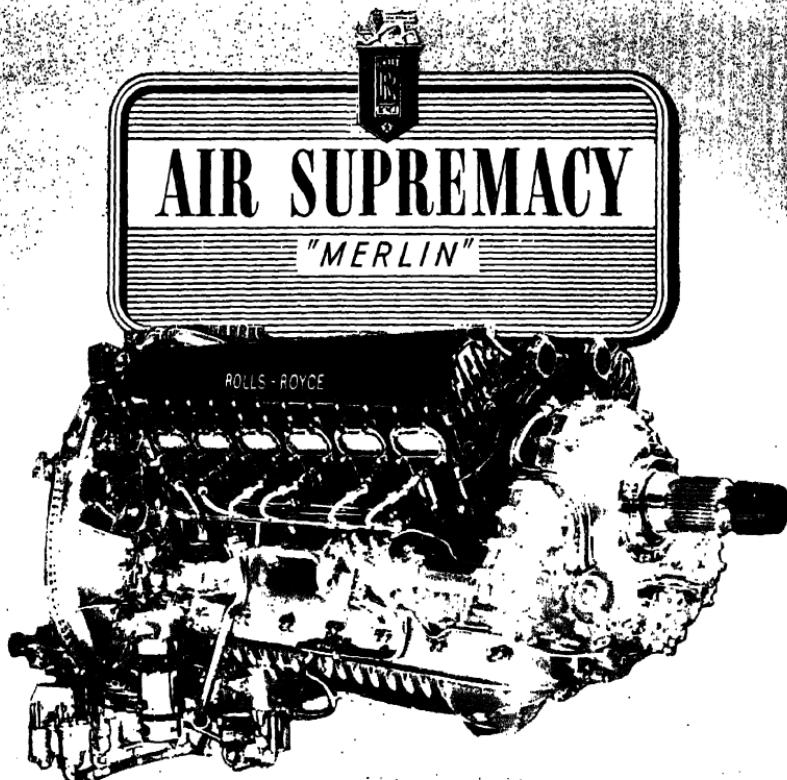
RANGER AIRCRAFT ENGINES
Division of Fairchild Engine and Airplane Corporation • Farmingdale, Long Island



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AIRCRAFT AND MARINE CRAFT PROPELLERS • AERO AUXILIARY EQUIPMENT



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In this air supremacy must be recognised the vital contribution made throughout the war by operational aircraft powered with Rolls-Royce engines.

HENLEY

WHITLEY

DEFIANT

HALIFAX

SEAFIRE

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HURRICANE

WELLINGTON

BEAUFIGHTER

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SPITFIRE

FULMAR

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ROLLS-ROYCE
AERO ENGINES



Engines roaring, an American Bomber stands poised on her runway . . . literally "coiled to strike" at the enemy. For the steady beat of her mighty engines depends on this coil . . . the coil of a Bendix-Scintilla* Aircraft Magneto. In this one vital part . . . precisely designed, tested and re-tested . . . thousands of careful turns of fine wire step up voltage from 18 to 18,000 . . . produce, with unfailing dependability, powerful, precisely timed sparks for engine ignition.

Bendix-Scintilla is proud of the

many contributions its engineers have made to the advancement of aircraft ignition . . . contributions destined to play as vital a role on the sky transports of tomorrow as they do in the battle planes of today.

THE WORLD'S FINEST AIRCRAFT IGNITION



Bendix-Scintilla Aircraft Magneto's, Harnesses and Switches, vital members of "The Invisible Crew," are standard equipment for the major aircraft engine manufacturers, including:

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• Lycoming • Lawrence • Wright
Aero Corp. • Pratt & Whitney
Warner • Packard • Ranger
Ford • Nash • Chrysler • Kinner.

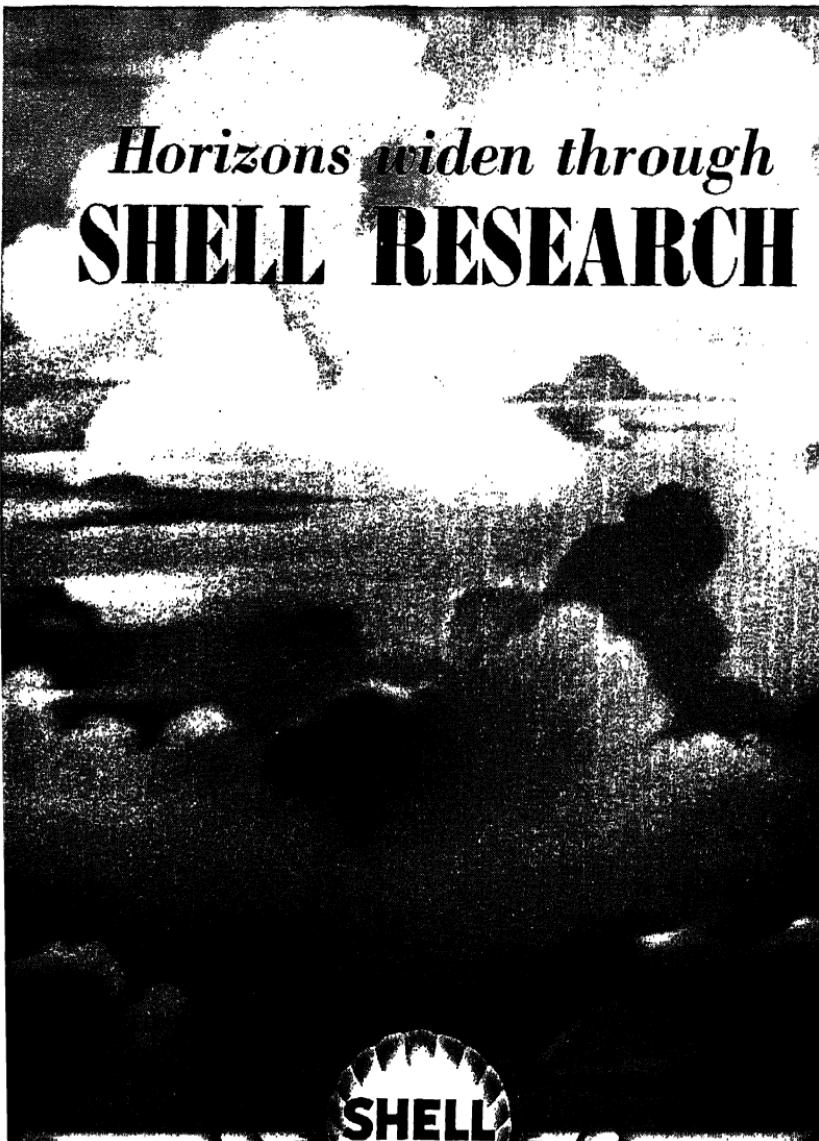
SCINTILLA MAGNETO DIVISION

SIDNEY, NEW YORK

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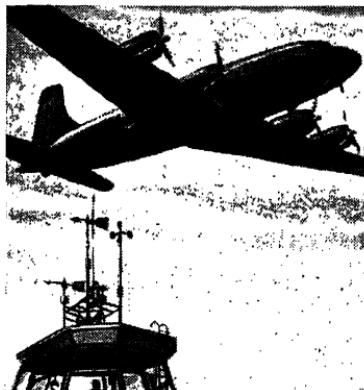


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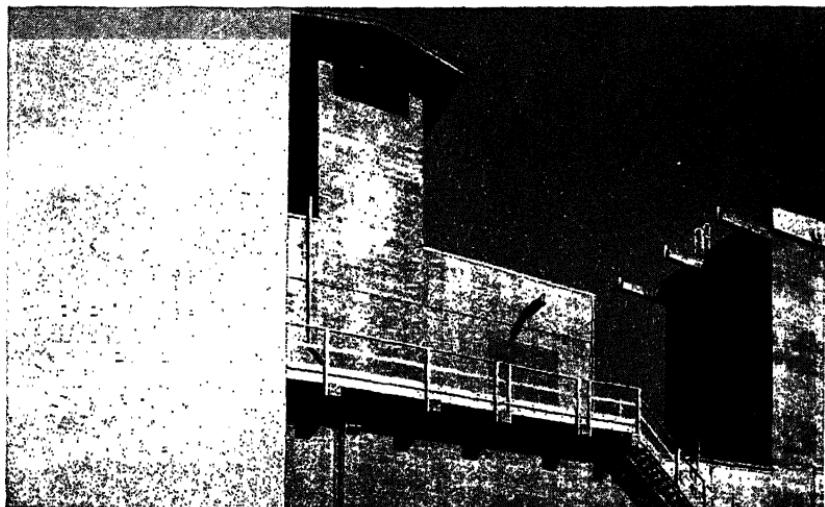
ternally—no piercing of cylinders. It is designed for use on all types of engines and aircraft. Where fuel economy is important—as it will be in postwar commercial aviation—this new flight instrument will stand continuous guard against wasteful conditions.

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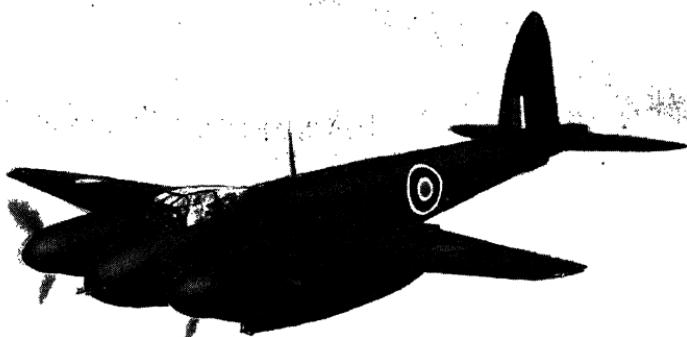
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CYCLOCNES AND WHIRLWINDS PAY THEIR WAY

PREFACE

AIRCRAFT ENGINES OF THE WORLD, 1945 edition, is the third volume of this international reference book. It contains complete data on all the latest aircraft engines of the United States, Great Britain, Australia, France, Germany, Italy, Japan and the U.S.S.R. It also includes jet propulsion engines and airborne auxiliary power plants. The contents have been revised as of January, 1945, and much of the material is exclusive.

Statistically, the 1945 edition of the book contains 352 pages compared with 320 pages for 1944. This increase has been made necessary to provide space for important new features. The standardized engine data section comprises 122 aircraft engines with full page photographs. Of this total, 37 data pages and 56 photographs are new, and 38 data pages contain major revisions. Approximately 60 per cent of the data pages and 45 per cent of the photographs in the standardized engine data section have been changed for 1945, apart from the additional features which have been added.

Jet propulsion has a special section devoted to it in the 1945 edition. In it will be found typical jet engines and gas turbines of American, British and German manufacture. The difference between the various kinds of jet engines is given in simple terms, and their cyclic functioning is explained. Photographs, sectional views and cut-away drawings are used to illustrate these new power plants.

Japanese aircraft engines—both air-cooled and liquid-cooled—are now featured in this new edition. This information is of vital interest in view of the growing importance of the Pacific as a theater of war. Data is given on all of the latest Japanese engines, and three of them are illustrated and described in complete detail. This material is the most up-to-date that has ever been published, here or abroad.

New United States aircraft engines described in *complete* detail and illustrated with full-page photographs, include the Allison V-1710-E11 (2-stage), V-1710-F30 (turbo) and V-3420-A16 (turbo); the Continental C-140-1; the Franklin 6ACV-298 and 6ACV-403 helicopter engines; the General Motors Research X-250-D (2-cycle); the Lycoming O-435-D helicopter engine; the Packard V-1650-3 (2-stage) and V-1650-7 (2-stage); the Pratt & Whitney Twin Wasp R-1830 SSC7-G (2-stage), Twin Wasp R-2000 2SD-G, and Double Wasp R-2800 2SB-G (1-stage) and R-2800 SSB2-G (2-stage); the Ranger SGV-770D-5; the Warner Super Scarab 185; the White R-275S; and the Wright Cyclone 7 R-1300 C7BA, Cyclone 9 R-1820 C9HC, Cyclone 14 R-2600 C14BB and Cyclone 18 R-3350 C18BA.

New foreign aircraft engines described in *complete* detail and illustrated with full-page photographs, include the British Bristol Mercury XV, Pegasus XVIII, Taurus XII and Hercules XVI (all 100/130 grade); the Cirrus Minor (Series II); the Napier Sabre IIA; and the Rolls-Royce Merlin 63 (2-stage), Griffon IV (1-stage) and Griffon 65 (2-stage); the Australian Commonwealth Aircraft R-1340 and R-1830, and General Motors-Holdens Gipsy Major; the German Daimler-Benz DB 603 and DB 605, and Junkers Jumo 206 (Diesel) and Jumo 213; and the liquid-cooled Japanese Aichi Atsuta. The new British Rotol P-6 airborne auxiliary power plant is also included.

In addition to complete data on the afore-mentioned engines, there is also considerable data on important new engines such as the United States Continental I-1430 and Pratt & Whitney Wasp R-2800 (C-series); the British Bristol Centaurus, Bristol Hercules XVII and XVIII, Napier IIB, and Rolls-Royce Merlin, 32, 72 and 73; the German Argus As 411, B.M.W. 802, Daimler-Benz DB 606 and DB 610, and Junkers Jumo 208 (Diesel); the Japanese Kawasaki Type 2, Mitsubishi Kasei and Nakajima Homare; the U.S.S.R. M-82 and M-107; and many other Japanese and Soviet engines.

The author of this book is an American-born citizen who has been connected with aviation since 1914. In England, he served his apprenticeship with the British Thomson-Houston Company Ltd. During World War I, he was with A. V. Roe & Company Ltd., and the Royal Aircraft Establishment. In the United States he has been with the Boeing Aircraft Company and the Douglas Aircraft Company. During World War II, his aviation activities have been with the War Production Board, the Board of Economic Warfare and the War Manpower Commission of the United States Government.

Other aviation books by the author include *Diesel Aircraft Engines* (1936), *Aircraft Diesels* (1940), *Aircraft Engines of the World* (1941), *Diesel Aviation Engines* (1942), and *Aircraft Engines of the World*, (1944).

INTRODUCTION

Progress made with aircraft engines during the past year shows that a steady gain in power output and efficiency has been obtained by refinements in design as well as by the development of new types of engines. Improved cooling has played an important part and better carburation has been a contributing factor. Higher grade fuels have enabled higher boost pressures to be used resulting in increased brake mean effective pressures and increased power outputs. Recent progress made with high-powered air-cooled engines and liquid-cooled engines is shown in the following tabulation.

HIGH-POWERED AIRCRAFT ENGINES, 1944-1945

Engine		Max. h.p.	Dis- placement		Maximum h.p. per		Maximum b.m.e.p.	
Make	Model		cu.in.	liters	cu.in.	liter	cyl.	lb./ sq.in.
AIR-COOLED ENGINES (RADIAL)								
Pratt & Whitney	R-2800	2,000	2,804	45.9	0.71	43.6	117	208 14.6
Wright	R-2600	1,900	2,603	42.7	0.73	44.5	136	206 14.5
Wright	R-3350	2,200	3,347	54.9	0.66	40.1	122	187 13.1
Bristol	Hercules	1,675	2,360	38.7	0.71	43.3	120	194 13.6
Bristol	Centaurus	2,000	3,270	53.6	0.61	37.3	117	— —
Gnome-Rhone	14R	1,660	2,360	38.7	0.70	42.9	118	213 15.0
B.M.W.	801	1,700	2,550	41.8	0.67	40.6	121	196 13.8
Piaggio	P. XII	1,500	3,234	53.0	0.49	28.3	83	175 12.3
Mitsubishi	Kasei	1,800	2,570	42.1	0.70	42.7	129	— —
Nakajima	Homare	1,800	2,185	35.8	0.82	50.3	100	— —
LIQUID-COOLED ENGINES (IN-LINE)								
Allison	V-1710	1,475	1,710	28.0	0.86	52.7	123	227 16.0
Allison	V-3420	2,600	3,420	56.0	0.76	46.4	108	201 14.1
Continental	I-1430	2,100	1,425	23.3	1.47	90.1	175	342 24.0
Napier	Sabre	2,200	2,240	36.7	0.98	60.0	92	210 14.7
Rolls-Royce	Merlin	1,650	1,649	27.0	1.00	61.1	137	264 18.6
Rolls-Royce	Griffon	2,000	2,240	36.7	0.89	54.5	166	256 18.0
Daimler-Benz	DB 603	1,800	2,720	44.5	0.66	40.5	150	194 13.6
Daimler-Benz	DB 605	1,500	2,180	35.7	0.69	42.0	125	202 14.2
Junkers	Jumo 213	1,700	2,250	36.9	0.76	46.1	142	223 15.7
U.S.S.R.	AM-38	1,600	2,800	45.9	0.57	34.9	133	201 14.1

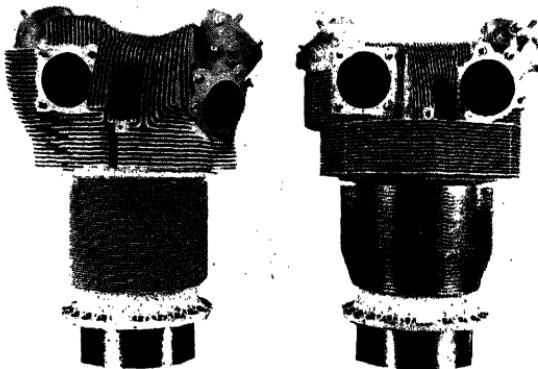
The figures in the above tabulation are based on the military ratings of the engines in all instances. Particular attention is called to the figures for the latest German and Japanese engines.

Five grades of aviation gasoline are now available for American and British aircraft engines, as shown in the following tabulation.

AVIATION GASOLINE, 1944-1945

Gasoline Grade	U.S.A. Specification	British Specification	Used in
73 octane	AN-F-23	RDE/F/73 OS	Small engines
80 octane	AN-F-24	None	Small engines
87 octane	AN-F-25	D.T.D. 230	Medium engines
91/96 grade	AN-F-26	D.E.D. 2474	Airline engines
100/130 grade	AN-F-28	D.E.D. 2475	Military engines

Other countries use aviation gasoline of lower grades. Germany uses 92-octane gasoline of high aromatic content in its high-powered engines, but direct fuel injection compensates to some extent for this deficiency. Japan also uses 92-octane gasoline. In the U.S.S.R., 95-octane gasoline is standard in military aircraft engines.



OLD AND NEW STYLE CYLINDERS—WRIGHT

UNITED STATES OF AMERICA

The United States of America has many achievements to its credit in the aircraft engine field. Wright is now producing the most powerful air-cooled engine in the world with a rating of 2,200 h.p. New W-type aluminum alloy fins permanently secured to the cylinder barrels, and forged aluminum alloy cylinder heads permitting machined finning, are helping to increase the performance of Wright engines. Pratt & Whitney is manufacturing an air-cooled engine rated at 2,100 h.p. equipped with a 2-stage supercharger. A water injection device developed by Pratt & Whitney enables increased bursts of power to be obtained momentarily from its engines in combat.

In the liquid-cooled engine field, Allison is now manufacturing a high-altitude engine rated at 1,325 h.p. equipped with a 2-stage supercharger, and it is also producing the most powerful liquid-cooled engine in the world with a rating of 2,600 h.p. Packard is continuing to do a good production job with the 2-stage Rolls-Royce Merlin rated at approximately 1,600 h.p., and Continental has now undertaken the manufacture of this 2-stage British engine.

With regard to medium-powered engines, Ranger has an improved version of its air-cooled inverted vee-type engine in production equipped with its new Al-Fin (integrally bonded steel and aluminum alloy) cylinders. Jacobs is continuing to manufacture its well-tried air-cooled radials in addition to building Pratt & Whitney Wasp Junior and Wasp engines.

In the low-powered field, Continental has brought out a new series of 6-cylinder horizontally-opposed air-cooled engines suitable for post-war aircraft. Franklin helicopter engines have been augmented by a more powerful air-cooled power plant which is now being used in military aircraft. General Motors (Research Laboratories) has developed an 8-cylinder X-type liquid-cooled 2-cycle engine for small aircraft. Lycoming has added a 6-cylinder helicopter engine to its line of horizontally-opposed air-cooled power plants. Warner has brought out a new 7-cylinder air-cooled radial for post-war use. White has a small 5-cylinder air-cooled radial ready for production.

Firms in the automotive field such as Buick, Chevrolet, Chrysler (Dodge), Ford, Nash and Studebaker are continuing to produce large quantities of high-powered air-cooled engines of Pratt & Whitney and Wright designs.

In the Diesel field, Guiberson is proceeding with the development of air-cooled 4-cycle engines for post-war aircraft.

Jet propulsion engines are now being manufactured by General Electric.¹ Allison has recently undertaken to augment the production of G-E jet engines for military aircraft.

Airborne auxiliary power plants with small gasoline engines driving electric generators are being produced by Andover, Eclipse, Lawrance and Onan for military and civil needs.

In the aircraft engine equipment field, new devices have been developed and improvements to existing equipment have been made. General Electric turbo-superchargers are being produced in large quantities and they are now standard equipment for the engines in many of our latest combat planes. Bendix Aviation is making a big contribution with its Eclipse direct cranking and inertia electric starters capable of starting engines of more than 3,000 h.p.; with its Scintilla magnetos some of which are now supercharged for use in the sub-stratosphere; and with its Stromberg injection-type carburetors which pressure-atomize the fuel and function automatically at all altitudes.

¹ See Jet Propulsion section of this book, pages 336 to 341 inclusive.

American Bosch is manufacturing starting vibrators, magnetos and gasoline injection pumps. BG spark plugs of both mica and ceramic types are being produced in large quantities for the engines of the Allied nations. Breeze shielded ignition harness and cartridge-type starters are establishing a fine reputation for reliability, here and abroad.

Kollsman is now manufacturing a new horsepower indicator which shows both brake mean effective pressure and net horsepower output, and a new type of synchroscope for use with its electric tachometer. Sperry has developed the MI.T.-Sperry detonation indicator which detects pre-ignition in an engine, and an automatic mixture control for use with it which automatically corrects the fuel mixture. Other important developments include Eaton sodium-cooled valves which have done much to make high-powered engines possible; new fuel transfer pumps and booster pumps of high efficiency manufactured by Thompson Products; lightweight aluminum alloy oil coolers and coolant radiators pioneered by Clifford; and Molybdenum alloy steels for highly stressed parts such as crankshafts and connecting rods developed by Climax Molybdenum.

Shell and Standard of New Jersey have continued their research for finer fuels and lubricants, and better manufacturing methods. Standard recently opened a full-scale testing laboratory for aircraft engines up to 3,000 h.p. Shell has made similar progress in laboratory engine test equipment.

AIRCRAFT ENGINES

Allison Division of General Motors Corporation builds 12-cylinder and 24-cylinder in-line vee-type liquid-cooled power plants. Current production models of the 12-cylinder engine are the V-1710-E series characterized by a separate reduction gear box with a hollow propeller shaft for a cannon mounted approximately 8 feet (2.4 meters) ahead of the engine where it is driven by means of a 2-piece extension drive shaft; and the V-1710-F series characterized by a short nose reduction gear box attached directly to the front of the engine crankcase. All V-1710 engines are equipped with a gear-driven 1-speed supercharger integral with the engine.

The Allison V-1710-E19 (-85) engine has a 1-speed supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,125 h.p. at 15,500 ft. (4,700 m.).

The Allison V-1710-E11 (-93) is a more recent engine which, in addition to its 1-speed supercharger, has a variable-speed auxiliary stage supercharger at the rear of the engine driven by an extension shaft and controlled by a hydraulic coupling. It is rated at 1,325 h.p. at take-off with a military rating of 1,150 h.p. at 22,400 ft. (6,800 m.).

The Allison V-1710-F17R (-89) and -F17L (-91) engines are similar in design to the 1-stage V-1710-E series engines, except for the extension drive shaft. In addition to their gear-driven 1-speed super-

chargers, however, they are equipped with General Electric turbo-superchargers. They are rated at 1,425 h.p. at take-off with a military rating of 1,425 h.p. at 27,000 ft. (8 200 m).

The Allison V-1710-F30R (-111) and -F30L (-113) engines are still more recent power plants which have special supercharged ignition systems enabling them to function at very high altitudes. They are rated at 1,475 h.p. at take-off with a military rating of 1,475 h.p. at 30,000 ft. (9 100 m), with General Electric turbo-superchargers.



ALLISON ASSEMBLY LINE—UNITED STATES

The Allison V-3420-A16R (-11) and -A16L (-13) engines are 24-cylinder double vee-type versions of the V-1710. They have four cylinder blocks mounted on a common crankcase and two crankshafts geared to a common propeller shaft. They are equipped with gear-driven 1-speed superchargers and General Electric turbo-superchargers which maintain their take-off rating of 2,600 h.p. to an altitude of 25,000 ft. (7 600 m).

Allison Division, in addition to building aircraft engines of the reciprocating type, has recently undertaken the manufacture of General Electric jet propulsion engines.

Buick Motor Division (Aviation Engine Division) of General Motors Corporation is building 14-cylinder air-cooled radial engines of Pratt & Whitney design. These engines include the Twin Wasp R-1830 (C series) S3C4-G and the Twin Wasp R-2000 (D series) 2SD1-G.

Chevrolet Motor Division (Aviation Engine Division) of General Motors Corporation has been manufacturing Pratt & Whitney Twin Wasp R-1830 (C series) S3C3-G and S3C4-G 14-cylinder air-cooled radial engines, and it is now producing Double Wasp R-2800 (C series) 18-cylinder radials.



CHEVROLET CONVEYOR LINE—UNITED STATES

Continental Aviation & Engineering Corporation, a subsidiary of Continental Motors Corporation, is building 12-cylinder vee-type liquid-cooled engines similar to the Packard V-1650-7 2-stage engine of British Rolls-Royce Merlin design. It is also building a 12-cylinder liquid-cooled inverted-vee engine of its own design known as the Continental I-1430 which has a maximum output of 2,100 h.p. with a turbo-supercharger.

Continental Motors Corporation builds horizontally-opposed and radial air-cooled engines none of which are supercharged. The horizontally-opposed 4-cylinder engines of the A series are the 50 h.p. A-50, the 65 h.p. A-65, the 75 h.p. A-75 and the 80 h.p. A-80.

The Continental C-75-12 of the new C series is a horizontally-opposed 4-cylinder engine which is rated at 75 h.p. The C-85-12 engine of this series develops 85 h.p.

The Continental C-140-1 is the most powerful model of a new series of 6-cylinder horizontally-opposed engines which have the same bore

and stroke as the C series engines previously mentioned. This series includes two direct-drive engines—the 115 h.p. C-115-1 and the 125 h.p. C-125-1—and the geared-drive C-140-1 rated at 140 h.p.

The Continental W-670 is a 7-cylinder radial which has been produced in a variety of models. The W-670-M is a recent engine which is rated at 240 h.p.

Dodge-Chicago Plant, Division of the Chrysler Corporation, is building 18-cylinder air-cooled radials of Wright design. The engine now in production is the Cyclone 18 R-3350 (B series) 670C18BA.

Ford Motor Company (Aircraft Engine Division) is now producing 18-cylinder air-cooled Pratt & Whitney Double Wasp R-2800 (B series) 2SB-G radial engines.

Franklin engines built by the Aircooled Motors Corporation are of the horizontally-opposed air-cooled type. None of them are supercharged. The smallest engine is the 4-cylinder 4AC-176 which is rated at 65 h.p.

The Franklin 6AC-298 is a 6-cylinder engine with a slightly larger bore than the 4AC-176. The geared-drive 6ACG-298-H3 model is rated at 160 h.p.

The Franklin 6ACV-298 is similar to other 6AC series engines in general design, but it is constructed for mounting with its crankshaft in a vertical position so that it can be used in helicopters. Cooling is provided by a fan above the engine which circulates air through an enclosure around the unit. This engine has direct drive and it is rated at 160 h.p.

The Franklin 6ACV-403 is a 6-cylinder engine of a new series with a larger bore and stroke than previous models. It is designed for vertical installation in helicopters and it is rated at 245 h.p., with 190 h.p. available for cruising.

General Electric Company (Aviation Division) builds jet propulsion engines similar to the Whittle jet engine in England.¹

General Motors Corporation (Research Laboratories Division) has developed a 2-cycle liquid-cooled engine for use in small aircraft. The X-250-D, as this experimental X-type engine is called, has four cylinder blocks each containing two bores with a common combustion chamber, and a 2-throw crankshaft with slipper-type connecting rods. Piston-controlled ports are used for intake and exhaust and a blower is provided for scavenging. The engine is rated at 200 h.p. and it has been test flown.

Guiberson Diesel Engine Company builds air-cooled Diesel engines of 4-cycle design. The 9-cylinder radial A-1020 engine is not supercharged and it is rated at 310 h.p. It is equipped with direct fuel injection. It has been flown in civil aircraft and a similar engine known as the T-1020 is used in Army tanks and for amphibious operations. Development work is proceeding on larger Diesel engines equipped with superchargers.

¹See Jet Propulsion section of this book, pages 342 to 347 inclusive.

Jacobs Aircraft Engine Company builds 7-cylinder air-cooled radial engines of its own design none of which are supercharged. The Jacobs R-755 engine has the smallest displacement, and the R-755A1 (L-4MB) model is rated at 245 h.p. at take-off. The L-4MA7 model of this series with the same rating has an additional power take-off which can be used for accelerating the rotor of an autogiro before leaving the ground. Improved models of this series with increased power are being developed for post-war use.

The Jacobs R-915 engine is similar to the R-755, but it has a slightly larger bore and stroke. The R-915A1 (L-6MB) model is rated at 330 h.p. at take-off. The R-915A4 (L-6MBA) and L-6MA models with the same rating have an additional power take-off of high torque capacity making them suitable for use in jump take-off autogiros.

Jacobs also manufactures Pratt & Whitney Wasp Junior R-985 and Wasp R-1340 engines under license.

Kinner Motors Incorporated builds 5-cylinder air-cooled radial engines none of which are supercharged. The smallest one is the K-5 which is rated at 100 h.p.

The Kinner B-5 engine is similar to the K-5, but it has a larger bore and a higher compression ratio. It is rated at 125 h.p.

The Kinner R-5 engine is similar to the B-5, but it has a slightly larger bore and stroke and a higher compression ratio. The R-55 model of this series is rated at 160 h.p.

Lycoming Division of The Aviation Corporation builds horizontally-opposed and radial air-cooled engines none of which are supercharged. The smallest opposed-cylinder engine is the 4-cylinder O-145. The GO-145 geared model of this series is rated at 75 h.p.

The Lycoming O-235 is a 4-cylinder opposed engine of slightly larger bore and stroke than the O-145. It is rated at 100 h.p. There is also a 6-cylinder version of the O-235 known as the O-350 which is rated at 150 h.p.

The Lycoming O-290 is a 4-cylinder opposed engine similar to the O-235, but with a slightly larger bore. It is rated at 130 h.p. at take-off.

The Lycoming O-435 engine is a 6-cylinder version of the O-290. The direct-drive O-435-C is rated at 185 h.p., and the geared-drive GO-435-B is rated at 220 h.p.

The Lycoming O-435-D engine is a new model of the O-435 series which is designed for vertical installation in helicopters. It is a direct drive engine and it is provided with a special fan for cooling purposes. It is rated at 212 h.p.

The Lycoming R-680 engine is a 9-cylinder radial of conventional design which is equipped with a ground blower. The R-680-E3 model is rated at 300 h.p. at take-off.

Nash Kelvinator Corporation (Aircraft Engine Division) is building 18-cylinder air-cooled Pratt & Whitney Double Wasp R-2800 (B series) SSB-2-G radial engines.

Packard Motor Car Company (Aircraft Engine Division) builds 12-cylinder vee-type liquid-cooled engines of Rolls-Royce Merlin design. The engines built for the U.S. Army Air Forces are known as the V-1650 series, and those built for the British have Merlin serial numbers.

The Packard V-1650-1 engine is similar to the British Merlin XX. It has a 2-speed 1-stage supercharger and it is rated at 1,300 h.p. at take-off with a military rating of 1,120 h.p. at 18,500 ft. (5 600 m).

The Packard V-1650-3 engine is similar to the British Merlin 61. It is equipped with a 2-speed 2-stage supercharger and a liquid-cooled aftercooler. It is rated at 1,380 h.p. at take-off with a military rating of 1,210 h.p. at 25,800 ft. (7 900 m).



PACKARD FINAL ASSEMBLY LINES—UNITED STATES

The Packard V-1650-7 engine is a more powerful version of the V-1650-3. It has a 2-speed 2-stage supercharger and it is rated at 1,490 h.p. at take-off with a military rating of 1,370 h.p. at 21,400 ft. (6 500 m).

The Packard-built Merlin 28, 29, 31, 33 and 38 engines manufactured for the British are similar to the British Merlin XX. They are equipped with 2-speed 1-stage superchargers and they are rated at 1,300 h.p. at take-off with a military rating of 1,120 h.p. at 18,500 ft. (5 600 m).

Pratt & Whitney Aircraft, Division of United Aircraft Corporation, builds air-cooled radial engines all of which are supercharged. The smallest one is the 9-cylinder Wasp Junior R-985. The SB3 model of this engine is rated at 450 h.p. at take-off with a military rating of

450 h.p. at 3,500 ft. (1 100 m). The T1B3 model of the series which has the same take-off rating, can be adapted for use in helicopters. The Wasp Junior is no longer manufactured by Pratt & Whitney, but it is built under license by the Jacobs Aircraft Engine Company.

The Pratt & Whitney Wasp R-1340 is a 9-cylinder radial of considerably larger displacement than the Wasp Junior. The S3H1-G geared model is rated at 600 h.p. at take-off with a military rating of 600 h.p. at 3,000 ft. (900 m). The S1H1 direct-drive engine of the series is manufactured under license by the Commonwealth Aircraft Corporation Pty. Ltd. in Australia. Pratt & Whitney no longer builds the Wasp, but it is still produced in the United States by the Jacobs Aircraft Engine Company.



PRATT & WHITNEY PACKING ROOM—UNITED STATES

The Pratt & Whitney Twin Wasp R-1830 (C series) engine is a 14-cylinder version of the Wasp, but with slightly smaller bore and stroke. The S3C4-G model has a 2-speed 1-stage supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,050 h.p. at 13,100 ft. (4 000 m). The S1C3-G model with the same take-off rating has a 1-speed supercharger and it can be equipped with a General Electric turbo-supercharger. The last-mentioned engine is manufactured under license by the Commonwealth Aircraft Corporation Pty. Ltd. in Australia.

The Pratt & Whitney Twin Wasp R-1830 (C series) engine has also been produced with a 2-speed 2-stage supercharger. On the SSC7-G model, the supercharger comprises a main stage and an auxiliary stage, the latter having a 2-speed impeller. This engine is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 17,500 ft. (5 300 m).

The Pratt & Whitney Twin Wasp R-2000 (D series) is a 14-cylinder radial similar to the Twin Wasp R-1830, but with a slightly larger bore. The 2SD1-G model has a 2-speed 1-stage supercharger and it is rated at 1,450 h.p. at take-off with a military rating of 1,100 h.p. at 16,000 ft. (4 900 m).

The Pratt & Whitney Double Wasp R-2800 (B series) engine is an 18-cylinder version of the Twin Wasp R-2000, but with a slightly longer stroke. The 2SB-G model has a 2-speed 1-stage supercharger and it is rated at 2,000 h.p. at take-off with a military rating of 1,600 h.p. at 13,500 ft. (4 100 m). The TSB1-G model of the series with the same take-off rating has a 1-speed supercharger and it can be equipped with a General Electric turbo-supercharger.

The Pratt & Whitney Double Wasp R-2800 (B series) engine is also built with a 2-speed 2-stage supercharger. On the SSB2-G model, the supercharger consists of a main stage and an auxiliary stage, the latter having a 2-speed impeller. This engine is rated at 2,000 h.p. at take-off with a military rating of 1,650 h.p. at 22,500 ft. (6 800 m).

The Pratt & Whitney Double Wasp R-2800 (C series) engine has forged aluminum alloy cylinder heads permitting machined finning, and improved supercharging. Engines of this series have a take-off rating of 2,100 h.p. All other information is restricted as of January, 1945.

Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corporation, builds air-cooled inverted in-line engines. The smaller of the two engines now in production is the Ranger 6-440C which is a 6-cylinder unsupercharged power plant. The 6-440C-5 model is rated at 200 h.p. The engine is manufactured under license by Fabrica Nacional de Motores (Government Engine Factory) in Brazil.

The Ranger SGV-770 (C series) engine is a 12-cylinder inverted vee-type power plant of smaller bore and stroke than the 6-440C. Relatively, however, it develops much more power as it is equipped with a 1-speed supercharger and it runs at higher crankshaft speed. It has Al-Fin cylinder barrels (steel barrels with integral aluminum alloy fins) which greatly improve its cooling. The SGV-770C-1B model is rated at 520 h.p. at take-off with a military rating of 520 h.p. at 12,000 ft. (3 700 m).

The Ranger SGV-770 (D series) engine is a new improved version of the SGV-770 C-series engine. It is equipped with a 1-speed supercharger and a special Bendix-Stromberg carburetor which provides direct fuel injection onto the supercharger impeller. It is rated at 700 h.p. at take-off and 600 h.p. at 8,000 ft. (2 400 m).

Studebaker Corporation (Aviation Division) is building 9-cylinder air-cooled Wright R-1820 (G series) C9GC radial engines.

Warner Aircraft Corporation builds 7-cylinder air-cooled radial engines none of which are supercharged. The smallest one is the Scarab 50 which is rated at 130 h.p. at take-off.

The Warner Super Scarab 185 is a new engine which is similar to the Super Scarab 165, but it has a slightly larger bore. The Super Scarab 185 is rated at 200 h.p. at take-off and it is intended for post-war aircraft.

White Aeronautical Corporation has developed a new 5-cylinder air-cooled radial engine suitable for post-war use. The R-275S model is not supercharged and it is rated at 115 h.p. at take-off.

Wright Aeronautical Corporation builds air-cooled radial engines. The smallest one is the 7-cylinder Whirlwind R-760 which is equipped with a ground blower. The R-760-E2 model is rated at 350 h.p. at take-off. This engine is no longer manufactured by Wright, but it is built under license by Fabrica Nacional de Motores in Brazil.



WRIGHT POWERED ASSEMBLY LINES—UNITED STATES

The Wright Whirlwind R-975 is a 9-cylinder version of the Whirlwind R-760. The R-975-E3 model has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 420 h.p. at 1,400 ft. (450 m). This engine is no longer being produced by Wright, but it is manufactured under license by Fabrica Nacional de Motores in Brazil.

The Wright Cyclone 7 R-1420 engine is a new 7-cylinder version of the Wright Cyclone 9. It embodies the latest improvements such as cylinders with W-type aluminum alloy cooling fins permanently secured to the barrels, and forged aluminum alloy cylinder heads permitting the machining of deeper and thinner fins. The 735C7BA1 commercial model has a 2-speed supercharger and it is rated at 700 h.p. at take-off with a normal rating of 500 h.p. at 17,000 ft. (5 200 m).

The Wright Cyclone 9 R-1820 is a 9-cylinder engine of nearly twice the displacement of the Whirlwind R-975. The Cyclone 704C9GC of the G series is equipped with a 2-speed supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,000 h.p. at 14,200 ft. (4 300 m). The 666C9GC model of this series has the same take-off rating, but it is equipped with a 1-speed supercharger and it can be used with a General Electric turbo-supercharger.

The Wright Cyclone 9 G-1820 C9HC engine of the more recent H series has the new cylinders with W-type aluminum alloy cooling fins and forged aluminum alloy cylinder heads. The 806C9HC1 model of this series is equipped with a 2-speed supercharger and it is rated at 1,350 h.p. at take-off with a military rating of 1,000 h.p. at 17,500 ft. (5 300 m). The 805C9HC1 model is also rated at 1,350 h.p. at take-off, but it has a 1-speed supercharger so that it is suitable for use with a turbo-supercharger.

The Wright Cyclone 14 R-2600 engine is a 14-cylinder version of the Cyclone 9, but with a slightly shorter stroke. The Cyclone 776C14BB of the B series is one of the latest models and it has the new W-type aluminum alloy cooling fins. It is equipped with a 2-speed supercharger and it is rated at 1,900 h.p. at take-off with a military rating of 1,450 h.p. at 15,000 ft. (4 600 m).

The Wright Cyclone 18 R-3350 engine is an 18-cylinder version of the Cyclone 14. Cyclone C18 B-series engines are equipped with the new W-type aluminum alloy cooling fins. The 711C18BA2 model has a 2-speed supercharger and it is rated at 2,200 h.p. at take-off with a military rating of 1,800 h.p. at 14,000 ft. (4 300 m). The 670C18BA model with the same take-off rating has a 1-speed supercharger and it can be equipped with two General Electric turbo-superchargers.

AIRBORNE AUXILIARY POWER PLANTS

Andover Motors Corporation builds an airborne auxiliary electric generating plant known as the Andover V-32. It is powered with a 2-cylinder 90 degrees vee-type air-cooled engine having a continuous rating of 10 h.p. at sea level.

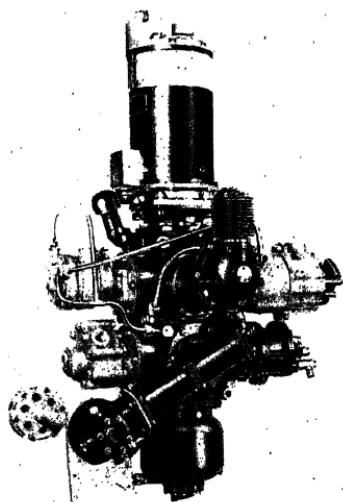
Eclipse-Pioneer Division of the Bendix Aviation Corporation manufactures an airborne auxiliary electric generating plant known as the Eclipse NEG. It has a 1-cylinder vertical air-cooled engine of the 2-cycle type with a continuous rating of 4 h.p. at sea level.

Lawrance Aeronautical Corporation now manufactures three types of airborne auxiliary electric generating plants. The Lawrance 20A generating plant has a 2-cylinder horizontally-opposed air-cooled engine with a continuous rating of 10 h.p. at sea level and 7.5 h.p. at 10,000 ft. (3 000 m). The Lawrance 30C and 30D generating plants are both powered with 2-cylinder horizontally-opposed air-cooled engines of larger displacement than the engine used for the 20A generating plant. These larger engines have a continuous rating of 10 h.p. at sea level and 5.7 h.p. at 20,000 ft. (6 100 m).

D. W. Onan & Sons has three types of airborne auxiliary electric generating plants in production. Onan 1C series generating plants are quite small and they are powered with a 1-cylinder vertical air-cooled engine having a continuous rating of 1.1 h.p. at sea level and 0.9 h.p. at 10,000 ft. (3 000 m). Onan OTC series generating plants are powered with a 2-cylinder horizontally-opposed air-cooled engine having a continuous rating of 4 h.p. at sea level and 3.5 h.p. at 10,000 ft. (3 000 m). Onan OFA series generating plants are powered with a 4-cylinder horizontally-opposed version of the engine used for the OTC series generating plants. This larger engine has a continuous rating of 11.7 h.p. at sea level and 6.5 h.p. at 18,000 ft. (5 500 m).

GREAT BRITAIN

Great Britain's aircraft engine industry has made many important contributions to aviation in recent years. In the high-powered engine field, Bristol has pioneered the sleeve valve to the point where it is now used on all the latest Bristol air-cooled radials. Napier also uses sleeve valves in its new liquid-cooled Sabre engine thereby reducing its overall width and making it a very compact power plant. Rolls-Royce has continued the development of its high-powered Merlin and Griffon liquid-cooled vee-type engines. It is also producing highly efficient gear-driven 2-speed 2-stage superchargers which maintain sea level atmospheric pressure in the intake manifolds of its engines to an altitude of more than 40,000 ft. (12 200 m).



ROTOl ACCESSORY GEAR BOX
GREAT BRITAIN

Alvis has now completed the development of a medium-powered air-cooled radial engine for post-war feeder line aircraft. Rotol is producing a new airborne auxiliary electric generating plant powered with a sleeve-valve engine for use in large aircraft. It is also manufacturing important engine equipment such as remote drive accessory gear boxes, cooling fans and propellers. Vokes—a pioneer in filtration for the past 25 years—has continued its development and manufacture of high efficiency air filters

of the dry and viscous types, and fuel and lubricating oil filters. These filters are now standard on many of the latest British and American aircraft engines.

In the jet propulsion field, British Thomson-Houston has continued its development of the Whittle jet engine of the gas turbine type and has now placed this engine in production. In addition, B.T.H. is producing large quantities of magnetos, starters and generators.

Alvis Limited builds air-cooled radial engines. The Alvis Leonides is a 9-cylinder radial which was ready for production just prior to World War II, but which was set aside temporarily when Alvis was called upon to make parts for high-powered military aircraft engines. The Leonides has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 435 h.p. at 8,250 ft. (2 500 m). It is scheduled for post-war production.



BRISTOL CONVEYOR LINE—GREAT BRITAIN

Armstrong Siddeley Motors Limited builds air-cooled radial engines. The current production engine is the 7-cylinder Cheetah which is equipped with a 1-speed supercharger. The Cheetah XV is rated at 420 h.p. at take-off with a military rating of 400 h.p. at 4,000 ft. (1 200 m).

The Armstrong Siddeley Tiger is a 14-cylinder engine of larger bore and stroke than the Cheetah. The Tiger VIII has a 2-speed supercharger and it is rated at 920 h.p. at take-off and 780 h.p. at 14,250 ft. (4 300 m).

Bristol Aeroplane Company Limited builds air-cooled radial engines with both poppet valves and sleeve valves. The poppet-valve engines are the Mercury and the Pegasus. Both of these are 9-cylinder power plants. The Mercury XV and XXV have 1-speed superchargers and are rated at 905 h.p. at take-off with a military rating of 995 h.p. at 9,250 ft. (2 800 m), using 100/130 grade gasoline.

The Bristol Pegasus engine is similar to the Mercury, but it has a longer stroke. With the exception of the Pegasus XVIII, all engines of this series are equipped with 1-speed superchargers. The Pegasus XVIII has a 2-speed supercharger and it is now rated at 1,050 h.p. at take-off with a military rating of 965 h.p. at 13,000 ft. (4 000 m), using 100/130 grade gasoline.

The Bristol sleeve valve engines in production are the Perseus, the Taurus and the Hercules—developed from the prototype Aquila. The Perseus is a 9-cylinder radial. The Perseus XVI is equipped with a 1-speed supercharger and it is rated at 905 h.p. at take-off with a military rating of 955 h.p. at 5,000 ft. (1 500 m).

The Bristol Taurus engine is a 14-cylinder radial of smaller bore and stroke than the Perseus. The Taurus XII has a 1-speed supercharger and it is rated at 1,085 h.p. at take-off with a military rating of 1,130 h.p. at 3,500 ft. (1 100 m).

The Bristol Hercules engine is a 14-cylinder version of the Perseus. All of the more recent models are equipped with 2-speed superchargers. The Hercules XVI is rated at 1,615 h.p. at take-off with a military rating of 1,455 h.p. at 12,000 ft. (3 600 m). The Hercules XVII and the Hercules XVIII are both rated at 1,725 h.p. at take-off, with a military rating of 1,735 h.p. at 500 ft. (150 m) for the Hercules XVII and 1,565 h.p. at 8,000 ft. (2 400 m) for the Hercules XVIII.

The Bristol Centaurus is an 18-cylinder engine similar in construction to the Hercules, but it is of slightly larger individual cylinder displacement. It has an output of considerably more than 2,000 h.p.

The British Thomson-Houston Company Limited builds jet propulsion engines of Whittle design. B.T.H. jet engines are of the gas turbine type.¹

Cirrus engines manufactured by the Cirrus Engine Department of Blackburn Aircraft Limited, comprise three 4-cylinder air-cooled inverted in-line power plants none of which are supercharged. The smallest one is the 90 h.p. Cirrus Minor (Series I).

The Cirrus Minor (Series II) is similar to the Cirrus Minor (Series I) engine, except that it has a slightly larger bore. It is rated at 100 h.p. at take-off.

The Cirrus Major engine has a larger bore and stroke than the Cirrus Minor power plants. The Cirrus Major (Series I) is rated at 150 h.p. at take-off.

De Havilland Aircraft Company Limited builds air-cooled inverted in-line engines. Only the Gipsy Major and the Gipsy Six are active at

¹ See Jet Propulsion section of this book, pages 336 to 339.

present, but new engines are under development. The Gipsy Major I is a 4-cylinder unsupercharged engine which is rated at 130 h.p. at take-off. This engine is also built under license by General Motors-Holdens Pty. Ltd. in Australia.

The De Havilland Gipsy Six engine is a 6-cylinder version of the Gipsy Major. The Gipsy Six I (Gipsyqueen III) and the Gipsy Six II (Gipsyqueen I and II) are not supercharged. The Gipsy Six II engines are rated at 210 h.p. at take-off.

The De Havilland Gipsy Six IIIS (Gipsyqueen IV) engine is similar to the Gipsy Six II, but it is of slightly larger bore and stroke. It has a 1-speed supercharger and it is rated at 285 h.p. at take-off and 265 h.p. at 7,000 ft. (2 100 m.).



NAPIER CRANKCASE MACHINE SHOP—GREAT BRITAIN

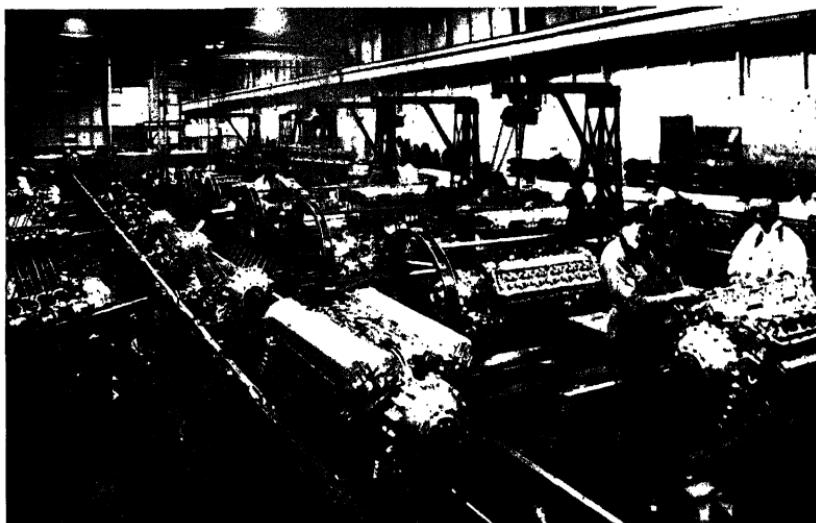
D. Napier & Son Limited now builds liquid-cooled horizontal H-type engines. Prior to World War II, however, it manufactured air-cooled vertical H-type power plants. Its outstanding air-cooled engine was the 24-cylinder poppet-valve Dagger. The Dagger VIII was equipped with a 1-speed supercharger and it was rated at 955 h.p. at take-off with a military rating of 1,000 h.p. at 8,750 ft. (2 700 m.).

The Napier Sabre which is now in production is a liquid-cooled horizontal H-type engine with 24 opposed cylinders and sleeve valves. Virtually, it consists of two 12-cylinder opposed engines, one on top of the other. The two cylinder blocks are attached horizontally to the crankcase. The two crankshafts are connected to the propeller shaft by compound reduction gears. The Sabre IIA is equipped with a 2-speed supercharger and it is rated at 2,200 h.p. at take-off. The Sabre IIB develops 2,400 h.p. at take-off.

Rolls-Royce Limited builds liquid-cooled in-line engines. The basic engine in the years prior to World War II was the Kestrel from which the Peregrine was developed. The Peregrine I is a modern engine equipped with a 1-speed supercharger. It is rated at 765 h.p. at take-off with a military rating of 960 h.p. at 12,000 ft. (3 700 m).

The Rolls-Royce Vulture is a 24-cylinder X-type version of the Peregrine. The Vulture II has a 2-speed supercharger and it is rated at 2,010 h.p. at take-off with a military rating of 1,710 h.p. at 15,000 ft. (4 600 m).

The Rolls-Royce Merlin is a 12-cylinder vee-type engine which is a modernized scaled-up version of the Kestrel. The Merlin 45 is a recent model equipped with a 1-speed 1-stage supercharger. It is rated at



ROLLS-ROYCE ASSEMBLY LINE—GREAT BRITAIN

1,185 h.p. at take-off with a military rating of 1,515 h.p. at 11,000 ft. (3 400 m). The Merlin 32 of the same series which is used in carrier-based torpedo planes develops its maximum power at take-off and at low altitudes.

The Rolls-Royce Merlin XX is one of the best known models equipped with a 2-speed 1-stage supercharger. This engine is rated at 1,280 h.p. at take-off with a military rating of 1,480 h.p. at 12,500 ft. (3 800 m).

The Rolls-Royce Merlin 61 was the first production engine to be equipped with a 2-speed 2-stage supercharger. It is rated at 1,290 h.p. at take-off with a military rating of 1,390 h.p. at 23,500 ft. (7 200 m).

The Rolls-Royce Merlin 63 and Merlin 63A engines equipped with 2-speed 2-stage superchargers have a maximum output of more

than 1,650 h.p. The Merlin 72 and the Merlin 73 of this series are credited with an output of 1,750 h.p. at take-off.

Rolls-Royce Merlin engines are now manufactured under license by the Continental Aviation & Engineering Corporation and the Packard Motor Car Company in the United States of America.¹

The Rolls-Royce Griffon is a new 12-cylinder vee-type engine which is of 36 per cent greater displacement than the Merlin. It has the same displacement as the Rolls-Royce Buzzard which was manufactured in England some years ago. It also has the same bore and stroke as the Rolls-Royce R racing engine developed from the Buzzard. The racing engine was rated at 2,600 h.p. when it won the Schneider Trophy outright for Great Britain in 1931.

The Rolls-Royce Griffon IV is a relatively low altitude engine which is equipped with a 2-speed 1-stage supercharger. It has a maximum output of from 1,750 h.p. to 2,000 h.p.

The Rolls-Royce Griffon 65 has a 2-speed 2-stage supercharger which gives it an excellent performance at high altitudes. This engine has a maximum output of from 2,000 h.p. to 2,200 h.p.

The Whittle jet propulsion engine of the gas turbine type developed by Power Jets Limited is now being manufactured by the British Thomson-Houston Company Ltd. Royal Air Force interceptors powered with Whittle jet engines are now in service, but no specific details of the engine are available as of January, 1945.

AIRBORNE AUXILIARY POWER PLANTS

Rotol Limited builds airborne auxiliary electric generating plants for use on large aircraft. The Rotol P-6 generating plant has a 6-cylinder horizontally-opposed air-cooled engine with sleeve valves. This engine has a continuous rating of 60 h.p. at sea level and at 12,000 ft. (3 700 m). It drives both an A.C. alternator and a D.C. electric generator.

AUSTRALIA

Australia manufactures three types of aircraft engines—two of American design and one of British origin. Commonwealth Aircraft Corporation and General Motors-Holdens are the producers of these power plants.

Commonwealth Aircraft Corporation Pty. Ltd. builds two types of American Pratt & Whitney air-cooled radial engines under license. The Australian-built 9-cylinder Wasp R-1340 S1H1-G has a 1-speed supercharger and it is rated at 600 h.p. at take-off and 550 h.p. at 5,000 ft. (1 500 m). The Australian-built 14-cylinder Twin Wasp R-1830 S1C3-G also has a 1-speed supercharger and it has a rating of 1,200 h.p. at take-off with a military rating of 1,200 h.p. at 3,700 ft. (1 100 m).

¹For Rolls-Royce Merlin engines built in the United States of America, see pages 122 to 127 inclusive.

General Motors-Holdens Ltd. builds the British De Havilland Gipsy Major 4-cylinder inverted in-line air-cooled engine under license. The Australian-built Gipsy Major I is not supercharged and it is rated at 132 h.p. at take-off.

BRAZIL

Brazil manufactures three types of aircraft engines all of which are of American (U.S.A.) design. Both in-line and radial engines are to be produced in the recently completed Brazilian Government Engine Factory.

Fabrica Nacional de Motores (Government Engine Factory) builds Ranger and Wright air-cooled engines under license. The Brazilian-built Ranger 6-440C-5 6-cylinder inverted in-line engine is not supercharged and it is rated at 200 h.p. The Brazilian-built Wright Whirlwind R-760-E2 7-cylinder radial is ground boosted and it is rated at 350 h.p. at take-off. The Brazilian-built Wright Whirlwind R-975-E3 9-cylinder engine has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 420 h.p. at 1,400 ft. (400 m).

FRANCE

In the past, France has shown considerable productivity in the aircraft engine field. When French engines resume their place in aviation it will be seen that their development has not been neglected. Already, important projects are under way.

Béarn engines built by S.A. Constructions Mécaniques du Béarn are newcomers in the aviation field. The Béarn 6-cylinder air-cooled inverted in-line engine resembles the Renault 6Q, except that it is of slightly larger displacement. The Béarn 6D has a 1-speed supercharger and it is rated at 375 h.p. at take-off and 350 h.p. at 6,500 ft. (2 000 m), using 87-octane gasoline. It develops 410 h.p. at take-off with 100-octane gasoline.

Gnome et Rhône (Société des Moteurs) built air-cooled radial engines of two sizes prior to World War II. Both of these engines—the 14M and the 14N—were 14-cylinder power plants. The Gnome-Rhone 14M-8 had a 1-speed supercharger and it was rated at 750 h.p. at take-off and 680 h.p. at 7,000 ft. (2 100 m). The Gnome-Rhone 14N-48 which was of more than twice the displacement of the 14M series engines, was rated at 1,180 h.p. at take-off and 1,060 h.p. at 12,800 ft. (3 900 m). The Gnome-Rhone 14N-50 was equipped with a 2-speed supercharger and it was rated at 1,400 h.p. at take-off and 1,200 h.p. at 13,100 ft. (4 000 m).

The Gnome-Rhone 14R is a new 14-cylinder radial of the same displacement as the 14N series engines from which it was developed. The 14R-4 model has a 2-speed supercharger and it is rated at 1,590 h.p. at take-off with a military rating of 1,580 h.p. at 18,000 ft. (5 500 m).

The Gnome-Rhone 18R is an 18-cylinder version of the 14R engine. The 18R-1 is equipped with a 2-speed supercharger and it is rated at 2,200 h.p. at take-off and 2,150 h.p. at 22,300 ft. (6 800 m).

The Gnome-Rhone 28R is a 28-cylinder version of the 14R engine. Its cylinders are arranged in 4 rows of 7 cylinders each around a barrel-type crankcase. It has a 4-throw crankshaft and a fan is provided to assist cooling. It has two superchargers and direct fuel injection. It is designed for an output of 3,000 h.p. At present, it is in the project stage.

Hispano-Suiza (Société Francaise) built both air-cooled and liquid-cooled engines prior to World War II. Its air-cooled engines were the 14AA and the 14AB both of which were 14-cylinder radials equipped with 1-speed superchargers. The Hispano-Suiza 14AA was rated at 1,150 h.p., and the smaller Hispano-Suiza 14AB was rated at 750 h.p., both ratings being at 13,100 ft. (4 000 m).

The Hispano-Suiza 12X, 12Y, 12Z and 24Y are all liquid-cooled engines. Many of them have hollow propeller shafts for mounting a cannon. The 12X is a 12-cylinder vee-type engine equipped with a 1-speed supercharger. The 12X-12 is rated at 740 h.p. at take-off with a military rating of 690 h.p. at 12,800 ft. (3 900 m).

The Hispano-Suiza 12Y is a 12-cylinder vee-type engine of considerably larger displacement than the 12X from which it was developed. All models of the 12Y engine are equipped with 1-speed superchargers. The most recent engines of the series are the 12Y-50 and 12Y-51 which are rated at 1,100 h.p. at take-off with a military rating of 1,000 h.p. at 10,800 ft. (3 300 m).

The Hispano-Suiza 12Z is a new 12-cylinder vee-type engine with the same displacement as the 12Y power plant. It embodies a number of modifications such as 2 inlet valves and 2 exhaust valves per cylinder instead of the 1 inlet valve and 1 exhaust valve per cylinder on the 12Y. It is designed for direct fuel injection. The 12Z-1 has a 1-speed supercharger and it is rated at 1,300 h.p. at take-off with a military rating of 1,200 h.p. at 13,100 ft. (4 000 m) using 92-octane gasoline. It develops 1,500 h.p. at take-off with 100-octane gasoline.

The Hispano-Suiza 24Y is a 24-cylinder vertical H-type engine which utilizes four 12Y cylinder blocks and many other parts of this last-mentioned engine. The 24Y-90 has two 1-speed superchargers and it is designed for a take-off output of 2,200 h.p. It is in the project stage.

Mathis S.A. developed a 42-cylinder liquid-cooled engine known as the Mathis 42B just prior to World War II. It had 7 banks of 6 in-line cylinders arranged around a common crankcase. It was equipped with a 2-speed supercharger and it was designed for a maximum output of 2,800 h.p. It is still in the experimental stage.

Renault (S.A. des Usines) built three sizes of air-cooled inverted in-line engines prior to World War II. These engines had many parts in common such as cylinders, pistons, connecting rods and valve gear. The smallest one was the 4-cylinder Renault 4P-ei (Bengali) which was not supercharged and which was rated at 140 h.p.

The Renault 6Q was a 6-cylinder version of the 4P engine, but it developed considerably more power as it had a 1-speed supercharger. The Renault 6Q-04 was rated at 220 h.p. at take-off and 240 h.p. at 14,100 ft. (4 300 m).

The Renault 12R was a 12-cylinder inverted vee-type version of the Renault 6Q. It had a 1-speed supercharger and it was rated at 500 h.p. at take-off and 450 h.p. at 13,100 ft. (4 000 m).

GERMANY

Germany has made great progress in the aircraft engine field in recent years. It is the only country which has successfully operated Diesel aircraft engines in regular service.¹ It has pioneered direct fuel injection to the point where it is now used on all high-powered aircraft engines in Germany. It was the first country to adapt hydraulic drive to superchargers providing variable speeds for the impeller. Now, it is well advanced in the art of jet propulsion as is shown by its extensive use of gas turbine jet engines and rocket power.²

Seven firms are responsible for the basic designs of German aircraft engines of the reciprocating type. These firms and the serial numbers allocated to their products are: Argus (400); B.M.W. (100 and 800); Bramo B.M.W. (300); Daimler-Benz (600); Hirth (500); Junkers (200); and Zündapp (900). Jet propulsion engines of the gas turbine type are built by B.M.W. (003) and Junkers (004).

Argus Motoren G.m.b.H. builds air-cooled inverted-vee type engines. The Argus As 10-C3 is an 8-cylinder unsupercharged engine which is rated at 220 h.p. The supercharged version known as the As 401 is rated at 275 h.p. at take-off and 270 h.p. at 9,800 ft. (3 000 m).

The Argus As 410 is a 12-cylinder engine of smaller bore and stroke than the As 10-C3. It develops considerably more power, however, as it has a higher compression ratio and a higher crankshaft speed and it uses higher grade fuel. The Argus As 410-A1 is equipped with a 1-speed supercharger and it is rated at 450 h.p. at take-off and 360 h.p. at 9,800 ft. (3 000 m). The most recent model of this series is the As 411 which is rated at 500 h.p. at take-off with a military rating of 450 h.p. at 13,100 ft. (4 000 m).

B.M.W. (Bayerische Motoren Werke A.G.—now BMW Flugmotorenbau G.m.b.H.) builds air-cooled radial engines. The B.M.W. 132 is a 9-cylinder radial which was developed from the American Pratt & Whitney Hornet. The B.M.W. 132-K is a recent model which is equipped with direct fuel injection and a 1-speed supercharger. It is rated at 1,000 h.p. at take-off and 960 h.p. at 9,800 ft. (3 000 m).

The B.M.W. 801 is a 14-cylinder radial which is notable for being the first high-powered air-cooled aircraft engine to have its cooling assisted by a fan. All models of this engine are equipped with direct

¹ See *Aircraft Diesels*, by Paul H. Wilkinson, published by the Pitman Publishing Corporation, New York and Chicago.

² See Jet Propulsion section of this book, pages 337, 342 and 343.

fuel injection and 2-speed superchargers. The B.M.W. 801-D1 is rated at 1,700 h.p. at take-off with a military rating of 1,600 h.p. at 19,800 ft. (6 000 m).

The B.M.W. 802 is an 18-cylinder version of the B.M.W. 801. It is equipped with a 2-speed supercharger and it is rated at 2,000 h.p. at take-off with a military rating of 2,200 h.p. at 18,000 ft. (5 500 m).

The B.M.W. 003 is a jet propulsion engine of the gas-turbine type.

Bramo (Brandenburgische Motorenwerke G.m.b.H. — now BMW Flugmotorenwerke Brandenburg G.m.b.H.) builds air-cooled radial engines. The Bramo Sh 14A is a small unsupercharged 7-cylinder radial which originally was of Siemens design. The Sh 14A-4 is rated at 160 h.p. at take-off.

The Bramo Fafnir 323 is a 9-cylinder radial of approximately the same displacement as the B.M.W. 132. The most recent model is the Fafnir 323-P1 which is equipped with direct fuel injection and a 2-speed supercharger. It is rated at 985 h.p. at take-off with a military rating of 775 h.p. at 13,900 ft. (4 200 m).

Daimler-Benz builds liquid-cooled in-line engines. All of its engines are now equipped with hydraulic-drive variable-speed 1-stage superchargers and direct fuel injection. The DB 601-E is a recent 12-cylinder inverted vee-type engine which is rated at 1,375 h.p. at take-off with a military rating of 1,375 h.p. at 18,000 ft. (5 500 m). The DB 601-F1 has a rating of 1,395 h.p. at take-off and 1,400 h.p. at 19,700 ft. (6 000 m).

The Daimler-Benz DB 603 is a new 12-cylinder engine similar in general design to the DB 601, but it is of 31 per cent greater displacement. The DB 603 is rated at 1,800 h.p. at take-off with a military rating of 1,680 h.p. at 18,000 ft. (5 500 m).

The Daimler-Benz DB 605 is a new improved version of the DB 601, with a slightly larger bore. It has modified cylinder blocks and reduction gear, plain bearings in the connecting rod big-ends, a supercharger impeller of larger diameter, and improved valve gear giving better cylinder scavenging. The DB 605-A1 and the DB 605-B1 are rated at 1,500 h.p. at take-off with a military rating of 1,350 h.p. at 19,700 ft. (6 000 m).

The Daimler-Benz DB 606 power plant consists of two DB 601-N engines arranged side-by-side and connected through gears and clutches to a common propeller shaft. The DB 606 is rated at 2,400 h.p. at take-off with a military rating of 2,400 h.p. at 16,400 ft. (5 000 m).

The Daimler-Benz DB 610 power plant is similar in design to the DB 606, except that it comprises two DB 601-E engines which give it a take-off rating at 2,700 h.p. and a military rating of 2,600 h.p. at 19,000 ft. (5 800 m).

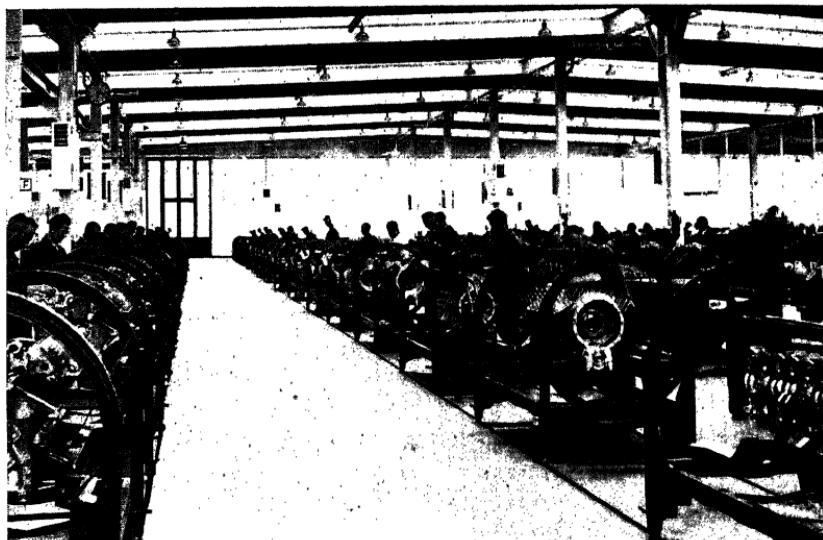
Hirth Motoren G.m.b.H. builds air-cooled inverted in-line engines. Four of them—the 4-cylinder HM 504, the 6-cylinder HM 506, the 8-cylinder HM 508 and the 12-cylinder HM 512—have the same bore and stroke so that many of their parts are interchangeable.

The Hirth HM 504-A2 is a 4-cylinder in-line engine which is not supercharged. It is rated at 95 h.p.

The Hirth HM 506-Al engine is a 6-cylinder version of the HM 504 and it is rated at 145 h.p. It is not supercharged.

The Hirth HM 508 is an 8-cylinder inverted vee-type engine which is equipped with a 1-speed supercharger. The HM 508-D is rated at 280 h.p. at take-off and 260 h.p. at 1,600 ft. (500 m).

The Hirth HM 512 is a 12-cylinder inverted vee-type engine of the same displacement as the 12-cylinder Argus As 410. The HM 512-B has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 360 h.p. at 9,800 ft. (3 000 m).



JUNKERS FINAL ASSEMBLY LINES—GERMANY

Junkers Flugzeug und Motorenwerke A.G. builds liquid-cooled in-line Diesel and gasoline engines. All of them are known by the trade name of *Jumo*. The Diesel engines are the Jumo 205, 206, 207 and 208. These engines function on the 2-cycle principle with direct fuel injection and compression ignition. They have 6 long vertical in-line open end cylinders with two opposed pistons in each cylinder barrel and a common combustion chamber. The pistons are connected to two crankshafts, one at the top and one at the bottom of the cylinder block. The two crankshafts are geared to a common propeller shaft.

The Junkers Jumo 205 Diesel is equipped with a 1-speed supercharger which also serves as a scavenging blower. The Jumo 205-Ea is rated at 700 h.p. at take-off and 650 h.p. at 8,200 ft. (2 500 m).

The Junkers Jumo 206 Diesel is similar to the Jumo 205, but it has a considerably larger bore giving it 53 percent greater displacement,

It is equipped with a 1-speed supercharger and it is rated at 1,200 h.p. at take-off and 1,000 h.p. at 9,800 ft. (3 000 m).

The Junkers Jumo 207 Diesel is a turbo-supercharged version of the Jumo 205. The Jumo 207-A is rated at 1,000 h.p. at take-off with a military rating of 1,000 h.p. at 32,800 ft. (10 000 m).

The Junkers Jumo 208 Diesel is a turbo-supercharged version of the Jumo 206. It is rated at 1,500 h.p. at take-off with a military rating of 1,500 h.p. at 26,000 ft. (8 000 m).

The Junkers Jumo 211 is a 12-cylinder inverted vee-type gasoline engine designed for military purposes. All models of the Jumo 211 are equipped with 2-speed superchargers and direct fuel injection. The Jumo 211-J is equipped with an intercooler and it is rated at 1,350 h.p. at take-off with a military rating of 1,260 h.p. at 16,400 ft. (5 000 m).

The Junkers Jumo 213 engine is a new modified version of the Jumo 211, with a slightly larger bore. The Jumo 213-A has a 2-speed supercharger with an intercooler, and direct fuel injection. It is rated at 1,700 h.p. at take-off with a military rating of 1,500 h.p. at 19,800 ft. (6 000 m).

The Junkers Jumo 004 is a jet propulsion engine of the gas turbine type.

Zündapp Werke A.G. builds small air-cooled in-line engines. The Zündapp Z 909-2AO is not supercharged and it is rated at 50 h.p.

ITALY

Italian aircraft engines in production in 1943 were all of the air-cooled type. Most of them originally were of American, British or French design. The exceptions were the Isotta Fraschini Delta engine and the experimental Campini jet propulsion engine both of which were of Italian design. Engine production was confined to four firms—Alfa Romeo, Fiat, Isotta Fraschini and Piaggio.

Alfa Romeo S.A. built inverted in-line and radial engines. There were two in-line engines many of the parts of which were interchangeable. These engines were similar to the British De Havilland Gipsy Major and Gipsy Six, and neither of them was supercharged. The smaller one was the 4-cylinder Alfa 110-1 which was rated at 130 h.p. at take-off.

The Alfa Romeo Alfa 115 was a 6-cylinder version of the Alfa 110. The Alfa 115-1 was rated at 205 h.p. at take-off.

The Alfa Romeo Alfa 126 was a 9-cylinder radial similar to the British Bristol Pegasus. The Alfa 126-RC34 was equipped with a 1-speed supercharger and it was rated at 780 h.p. at take-off and at 11,500 ft. (3 500 m). The Alfa 128-RC21 of the same series was rated at 950 h.p. at take-off and 860 h.p. at 6,900 ft. (2 100 m).

The Alfa Romeo Alfa 135 was an 18-cylinder version of the Alfa 126, but with a shorter stroke. The Alfa 135-RC32 had a 1-speed supercharger and it was rated at 1,620 h.p. at take-off with a military rating of 1,400 h.p. at 10,500 ft. (3 200 m).

Fiat S.A. built three sizes of radial engines. The Fiat A74 was a 14-cylinder engine equipped with a 1-speed supercharger. The A74-RC38 was rated at 890 h.p. at take-off and 840 h.p. at 12,500 ft. (3 800 m). The A76-RC40 of slightly larger displacement than the A74 series engines was rated at 1,100 h.p. at take-off and 1,000 h.p. at 13,100 ft. (4 000 m).

The Fiat A80 was a 14-cylinder engine similar to the A74, but with a longer stroke. The A80-RC41 had a 1-speed supercharger and it was rated at 1,030 h.p. at take-off and 1,000 h.p. at 13,500 ft. (4 100 m).

The Fiat A82 was an 18-cylinder radial similar to the A80, but with a slightly longer stroke. It was equipped with a 1-speed supercharger and it was rated at 1,400 h.p. at take-off and 1,250 h.p. at 13,800 ft. (4 200 m).

Isotta Fraschini (Fabrica Automobili) built inverted in-line engines. The Beta was a recent engine which was a 6-cylinder version of the 12-cylinder 550 h.p. inverted vee Isotta Fraschini Gamma. The Beta had a 1-speed supercharger and it was rated at 300 h.p. at take-off and 270 h.p. at 4,600 ft. (1 400 m).

The Isotta Fraschini Delta was a 12-cylinder inverted vee-type engine. It also had been developed from the Gamma, but it was of considerably larger displacement than this last-mentioned engine. There were several models of the Delta some of which had a raised hollow propeller shaft through which a cannon could be fired. The RC35-IDS had a 1-speed supercharger and it was rated at 770 h.p. at take-off with a military rating of 1,350 h.p. at 11,500 ft. (3 500 m).

Piaggio & Co. S.A. built five sizes of radial engines based upon French Gnome-Rhone designs. The smallest one was the P.VII which was a 7-cylinder engine. The P.VII-RC35 had a 1-speed supercharger and it was rated at 500 h.p. at take-off with a military rating of 460 h.p. at 11,500 ft. (3 500 m).

The Piaggio P.X engine was a 9-cylinder version of the P.VII. The P.X-RC35 had a 1-speed supercharger and it was rated at 650 h.p. at take-off with a military rating of 625 h.p. at 11,500 ft. (3 500 m). Other models of the P.X series included the 610 h.p. P.IX-RC40 which had a 2-speed supercharger, and the 700 h.p. P.XVI-RC35D and P.XVI-RC35S engines.

The Piaggio P.XI engine was a 14-cylinder version of the P.VII. The P.XI-RC40 had a 1-speed supercharger and it was rated at 1,000 h.p. at take-off with a military rating of 1,000 h.p. at 13,100 ft. (4 000 m).

The Piaggio P.XII engine was an 18-cylinder version of the P.VII, but with a slightly longer stroke. The P.XII-RC35 was equipped with a 1-speed supercharger and it was rated at 1,500 h.p. at take-off with a military rating of 750 h.p. at 13,100 ft. (4 000 m).

The Piaggio P.XXII was an 18-cylinder engine similar to the P.XII, but with a slightly larger bore. The P.XXII-RC35D had a 1-speed supercharger and it was rated at 1,700 h.p. at take-off with a military rating of 1,600 h.p. at 11,500 ft. (3 500 m).

JAPAN

Japanese aircraft engines showed up quite well at the beginning of World War II compared with the engines then in use by other countries. This was due to the Japanese policy of importing leading American, British, French and German engines, building a few of them under license, and then combining their best features into engines of their own. Since the outbreak of war, the Japanese have continued their development work with German technical assistance. In addition to powerful air-cooled radial engines of from 1,800 h.p. to 2,000 h.p., they now have in production liquid-cooled engines similar to the German Daimler-Benz DB 601. Recent improvements such as water injection and 2-stage superchargers are beginning to be found on the latest Japanese power plants.

Most of the aircraft engines produced by the Japanese are of the air-cooled radial type. Mitsubishi and Nakajima are responsible for the high-powered engines, and Hitachi (formerly Tokyo Gasu Denki) builds the low-powered engines needed for training purposes. Aichi and Nakajima are now manufacturing liquid-cooled inverted vee-type engines for Japan's high-altitude fighters. Other firms such as Showa and Tachikawa (formerly Ishikawajima) produce engines to the designs of the afore-mentioned firms, or manufacture component parts for them.

Aichi Tokei Denki K.K. builds the Atsuta which is a 12-cylinder liquid-cooled engine similar to the German Daimler-Benz DB 601-A inverted vee-type power plant. The Atsuta 21 is equipped with a hydraulic-drive variable-speed supercharger and direct fuel injection. It is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 13,500 ft. (4 100 m).

Hitachi Kokuki K.K. builds relatively small air-cooled radial engines. The smallest one is the 5-cylinder Hatsukaze which is rated at 90 h.p. The Kamikaze is a 7-cylinder version of the Hatsukaze and it is rated at 130 h.p. These engines are not supercharged.

The Hitachi Amakaze is a 9-cylinder engine of larger bore and stroke than the Hatsukaze and the Kamikaze. The Amakaze 11 is not supercharged and it is rated at 300 h.p.

Kawasaki Kokuki K.K. has specialized in liquid-cooled engines for a number of years. Prior to World War II, it manufactured 12-cylinder vee-type engines developed from the German B.M.W. VI. Now, it is producing a 12-cylinder inverted vee-type power plant similar to the German Daimler-Benz DB 601-A. The Kawasaki Type 2, as this latest engine is known, is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 13,500 ft. (4 100 m).

Mitsubishi Kokuki Kabushiki K. now builds air-cooled radial engines exclusively. The Mitsubishi Miozio was one of the first engines to be placed in production in the earlier stages of the Japanese warplane program. It was a 9-cylinder radial similar to the American Pratt & Whitney Hornet. It had a 1-speed supercharger and it was rated at 800 h.p. at take-off and 750 h.p. at 13,100 ft. (4 000 m).

The Mitsubishi Zuisei is a fairly recent 14-cylinder engine which is similar to the Pratt & Whitney Twin Wasp Junior. The Zuisei 13 has a 1-speed supercharger and it is rated at 850 h.p. at take-off with a military rating of 860 h.p. at 13,100 ft. (4 000 m).

The Mitsubishi Kinsei is a modern engine which has been in production since 1938. Its cylinders are of practically the same size as those of the British Armstrong Siddeley Tiger and it embodies many of the features of this last-mentioned engine including its valve gear and supercharger. The nose portion of the Kinsei containing the reduction gear, however, resembles that of the American Pratt & Whitney Twin Wasp. The Kinsei 44 is equipped with a 1-speed supercharger and it is rated at 1,000 h.p. at take-off with a military rating of 1,075 h.p. at 13,100 ft. (4 000 m). The more recent Kinsei 45 and Kinsei 46 also have 1-speed superchargers and they are rated at 1,000 h.p. at take-off with a military rating of 1,050 h.p. at 14,100 ft. (4 300 m).

The Mitsubishi Type 1 engine is a 14-cylinder version of the Miozio. It is of larger displacement than the Kinsei. The Mitsubishi Type 1 has a 2-speed supercharger and it is rated at 1,100 h.p. at take-off and 1,100 h.p. at 10,000 ft. (3 000 m). It was the prototype of the Mitsubishi Kasei.

The Mitsubishi Kasei is a new 14-cylinder radial developed from the Mitsubishi Type 1. It is the most powerful 14-cylinder engine in production in Japan. The Kasei 11 and Kasei 15 are rated at 1,500 h.p. at take-off with a military rating of 1,350 h.p. at 13,100 ft. (4 000 m). The Kasei 21, 22 and 25 are the latest models of the series and they are rated at 1,800 h.p. at take-off with a military rating of 1,500 h.p. at 16,400 ft. (5 000 m). All of these engines have 2-speed superchargers, and some of the latest ones are equipped with water injection.

Nakajima Hikoki K.K. builds air-cooled radial engines. The Nakajima Kotubuki is a 9-cylinder engine similar to the British Bristol Jupiter, but of smaller displacement. The Kotubuki II is rated at 500 h.p. at take-off and 450 h.p. at 12,000 ft. (3 600 m). The more recent Kotubuki III has a rating of 610 h.p. at take-off with a military rating of 680 h.p. at 12,000 ft. (3 600 m). Both of these engines have 1-speed superchargers.

The Nakajima Hikari is a 9-cylinder radial engine similar to the American Wright Cyclone 9. The Hikari I has a 1-speed supercharger and it is rated at 800 h.p. at take-off and 800 h.p. at 13,100 ft. (4 000 m). The Hikari II is equipped with a 2-speed supercharger and it has a rating of 1,000 h.p. at take-off with a military rating of 880 h.p. at 16,400 ft. (5 000 m).

The Nakajima Type 1 is a 14-cylinder radial which is similar to the 14-cylinder Wright Whirlwind GR-1510. It has a 1-speed supercharger and it is rated at 900 h.p. at take-off and 900 h.p. at 12,000 ft. (3 600 m). It was the prototype of the Nakajima Sakae.

The Nakajima Sakae is a 14-cylinder radial engine which was developed from the Nakajima Type 1. It was placed in production at

the beginning of World War II. The Sakae 11 is rated at 980 h.p. at take-off with a military rating of 950 h.p. at 10,000 ft. (3 000 m). The Sakae 12 has a rating of 1,000 h.p. at take-off and a military rating of 900 h.p. at 13,100 ft. (4 000 m). These engines have 1-speed superchargers. Later engines of the series such as the Sakae 21 and the Sakae 22 are equipped with 2-speed superchargers. These two last-mentioned engines are rated at 1,150 h.p. at take-off with a military rating of 950 h.p. at 19,700 ft. (6 000 m).

The Nakajima Type 2 engine is an 18-cylinder version of the Sakae. It has a 2-speed supercharger and it is rated at 1,400 h.p. at take-off with a military rating of 1,300 h.p. at 16,400 ft. (5 000 m). It was the prototype of the Nakajima Homare.

The Nakajima Homare is an 18-cylinder version of the Sakae. The Homare 10-20 series engines have 2-speed superchargers. The Homare 21 is one of the latest models and it is rated at 1,800 h.p. at take-off with a military rating of 1,600 h.p. at 16,400 ft. (5 000 m). It has a maximum emergency rating of 2,000 h.p. with water injection.

U. S. S. R.

Considerable progress has been made with aircraft engines in the Soviet Union in recent years. Much of this progress can be attributed to experience gained with some of the best engines of America, Great Britain, France and Germany, together with engineering assistance received from these countries. Both air-cooled and liquid-cooled engines of high power output are now in production in the Soviet Union. All engines are built in government factories and carry the designation "M" together with type number.

The M-11 engine is a small 5-cylinder air-cooled radial which is rated at 100 h.p. A geared version known as the M-11G is rated at 130 h.p. These engines are not supercharged.

The M-15 engine is a 9-cylinder air-cooled radial which was developed from the British Bristol Jupiter. It has a 1-speed supercharger and it is rated at 415 h.p. at take-off and 480 h.p. at 12,000 ft. (3 600 m).

The M-17 engine is a 12-cylinder liquid-cooled vee-type power plant which is similar to the German B.M.W. VI. It is not supercharged and it is rated at 680 h.p.

The M-26 engine is a 7-cylinder radial which is similar to the American Wright Whirlwind R-760. It is equipped with a ground blower and it is rated at 300 h.p.

The AM-38 engine is a 12-cylinder liquid-cooled vee-type power plant which is substantially of Soviet design.¹ It was developed from the AM-34 exhibited at the Paris Aero Show in 1936. The high-altitude AM-38A is equipped with a 2-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,400 h.p. at 19,700 ft. (6 000

¹ The AM series engines were designed by Alexander Mikulin whose initials are used to designate them.

m). The low-altitude AM-38B is equipped with a 1-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,500 h.p. at 6,600 ft. (2 000 m). The AM-35A engine of the same series has a 2-speed supercharger and it is rated at 1,350 h.p. at take-off with a military rating of 1,000 h.p. at 16,400 ft. (5 000 m).

The M-64 engine is a 9-cylinder air-cooled radial which was developed from the M-25—the Soviet equivalent of the American Wright Cyclone 9. It has a 2-speed supercharger and it is rated at 1,000 h.p. at take-off and at 13,100 ft. (4 000 m).

The M-82 engine is a new 14-cylinder air-cooled radial which is now in production. It has a 2-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,300 h.p. at 13,100 ft. (4 000 m).

The M-88 engine is a 14-cylinder air-cooled radial which was developed from the M-85—the Soviet equivalent of the French Gnome-Rhone 14N. It has a 2-speed supercharger and it is rated at 1,100 h.p. at take-off with a military rating of 1,000 h.p. at 15,100 ft. (4 700 m).

The M-105 engine is a 12-cylinder liquid-cooled vee-type power plant which was developed from the M-100—the Soviet equivalent of the French Hispano-Suiza 12Y. The M-105P has a hollow propeller shaft for a cannon. It is equipped with a 2-speed supercharger and it is rated at 1,100 h.p. at take-off with a military rating of 1,050 h.p. at 13,100 ft. (4 000 m). The M-105R is similar to the M-105P, except that it is not equipped for a cannon. The latest engine of the series is the M-107 which is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 16,400 ft. (5 000 m).

STANDARDIZED DATA PAGES

Standardized data pages are used to present the basic aircraft engines and the basic airborne auxiliary power plants described and illustrated in the following sections of the book. The arrangement of the data on the standardized data pages is as follows: First, there is a concise description of the engine, its construction and the major accessories with which it is equipped. Then, in tabular form, there are items such as bore, stroke, displacement (swept volume), compression ratio, overall dimensions, frontal area, total weight and weight per maximum horsepower.

Fuel and lubricating oil consumptions at cruising output are given in units of weight. The fuel grade and the viscosity of the lubricating oil at 210° F. (100° C) also are specified.

Efficiency figures such as maximum power output per unit of displacement, maximum power output per unit of piston area, maximum piston speed and maximum brake mean effective pressure have been calculated for comparative purposes.

Finally, the various horsepower rating are given such as:

Take-off rating, or the maximum horsepower which it is permissible to take from the engine at ground level and at low altitudes.

Military (combat) rating, or the maximum horsepower within limits of safety which it is permissible to use for military purposes—usually equal to the take-off rating.

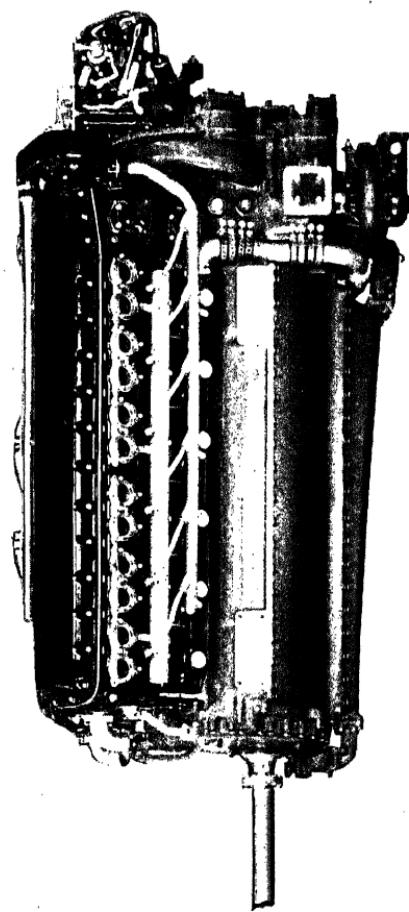
Normal rating, or the maximum horsepower which the engine can deliver continuously without undue stress.

Cruising rating, or the maximum horsepower recommended for continuous operation consistent with reasonable fuel economy.

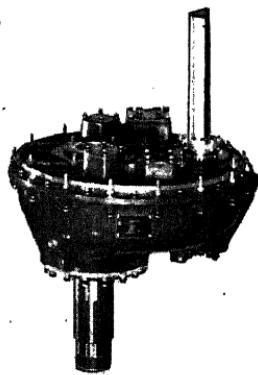
In the case of airborne auxiliary power plants, both the engine ratings and the electric generator outputs are given.

The status of the data on the standardized pages can be seen from the notation at the top of the page to the left of the country of origin. *New* denotes completely new data. *Revised* indicates major revisions. Unmarked pages have minor changes.

The engine tabulations at the back of the book include all of the basic engines presented in the standardized pages together with many others which cannot be set up in standardized page form due to lack of sufficient information.



Allison V-1710-E (1-stage)



Allison V-1710-E (1-stage)

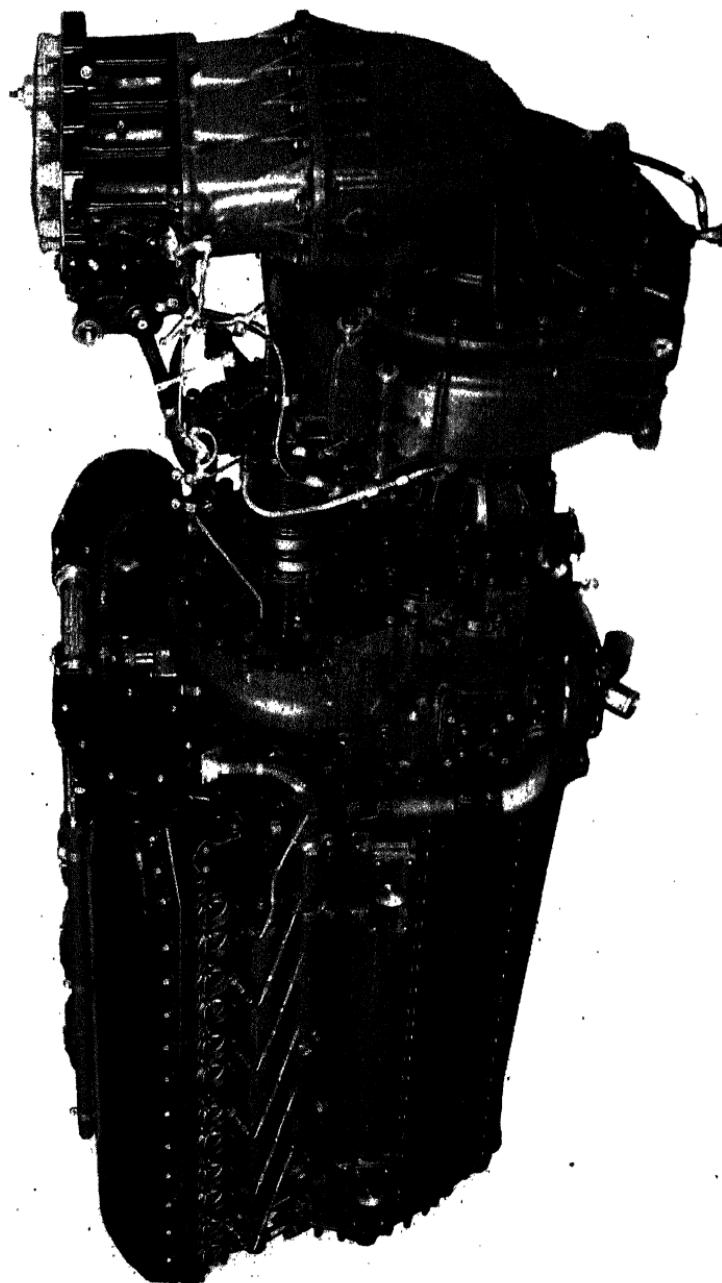
Model	V-1710-E19 (-85).	
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1, in remote gear box with extension drive shaft from engine. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven 1-speed supercharger, ratio 9.60:1.	
Carburation	1 Bendix-Stromberg PD-12K6 2-barrel injection type downdraft carburetor with automatic mixture control.	
Ignition	1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/m ²). Dry sump.	
Starter	Eclipse 915 inertia and direct cranking electric starter.	
Bore	5.50 in.	140 mm
Stroke	6.00 in.	152 mm
Displacement	1,710 cu.in.	28,0 lit
Compression ratio	6.65:1	6,65:1
Width	29.3 in.	745 mm
Height	37.6 in.	955 mm
Length (see Note 1)	194.0 in.	4 932 mm
Frontal area (gear box)	2.9 sq.ft.	0,27 m ²
Weight (see Note 2)	1,445 lb.	655 kg
Weight/horsepower	1.20 lb./h.p.	0,54 kg/hp
Fuel consumption (cr.)	0.56 lb./h.p./hr.	255 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.70 h.p./cu.in.	42,9 hp/lit
Output/piston area	4.21 h.p./sq.in.	0,65 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	185 lb./sq.in.	13,0 kg/cm ²
Rating (take-off)	1,200 h.p./3,000 r.p.m./51.5 in. (1 308 mm) Hg. boost	
Rating (military)	1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m)	
Rating (normal)	1,000 h.p./2,600 r.p.m./14,000 ft. (4 300 m)	
Rating (max. cruising)	750 h.p./2,300 r.p.m./14,000 ft. (4 300 m)	

Note 1: This length includes extension drive shaft, reduction gear box and propeller shaft. Length of engine alone is 69.9 in. (1 776 mm).

Note 2: This weight includes extension drive shaft, reduction gear box and propeller shaft. Weight of engine alone is 1,210 lb. (549 kg).

V-1710-E18 (-83): Same as V-1710-E19. Reduction gear ratio 0.50:1.

Additional models of Allison V-1710-E engines will be found on page 79.



710-E (2) *age*

Allison V-1710-E (2-stage)

Model	V-1710-E11 (-93).
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase, 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1, in remote gear box with extension drive shaft from engine. Hollow propeller shaft for cannon.
Supercharger	Gear-driven variable speed 2-stage supercharger. First stage in separate auxiliary unit, impeller ratio 6.85:1, with hydraulic coupling and automatic speed control regulated by air intake pressure. Second stage integral with engine, impeller ratio 8.1:1.
Carburation	1 Bendix-Stromberg PT-13E9 3-barrel injection type downdraft carburetor mounted on auxiliary supercharger unit. Direct fuel injection onto second-stage impeller. Automatic mixture control.
Ignition	1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.
Lubrication	Pressure feed, 60-70 lb./sq.in. (4.6-4.9 kg/cm ²). Dry sump.
Starter	Jack & Heintz JH-5L electric inertia starter.
Bore	5.50 in. 140 mm
Stroke	6.00 in. 152 mm
Displacement	1.710 cu.in. 28.0 lit
Compression ratio	6.65:1 6.65:1
Width	29.3 in. 745 mm
Height	37.6 in. 955 mm
Length (see Note 1)	194.0 in. 4 932 mm
Frontal area (gear box)	2.9 sq.ft. 0.27 m ²
Weight (see Note 2)	1,435 lb. 651 kg
Weight/horsepower	1.08 lb./h.p. 0.49 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr. 230 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr. 11 g/hp/hr
Gasoline grade	100/130 grade 100/130 grade
Oil grade (viscosity)	100-120 S.U. secs. 20.5-25.1 cs
Output/displacement	0.77 h.p./cu.in. 47.3 hp/lit
Output/piston area	4.65 h.p./sq.in. 0.72 hp/cm ²
Piston speed (max.)	3,000 ft./min. 15.2 m/sec
B.m.e.p. (max.)	203 lb./sq.in. 14.3 kg/cm ²
Rating (take-off)	1,325 h.p./3,000 r.p.m./54.0 in. (1 372 mm) Hg. boost
Rating (military)	1,150 h.p./3,000 r.p.m./22,400 ft. (6 800 m)
Rating (normal)	1,000 h.p./2,600 r.p.m./20,000 ft. (6 100 m)
Rating (max. cruising)	750 h.p./2,300 r.p.m./21,500 ft. (6 600 m)

Note 1: This length includes extension drive shaft, reduction gear box, propeller shaft and auxiliary supercharger unit. Length of engine alone is 69.9 in. (1 776 mm).

Note 2: This weight includes extension drive shaft, reduction gear box, propeller shaft and auxiliary supercharger unit. Weight of engine alone is 1,220 lb. (553 kg).



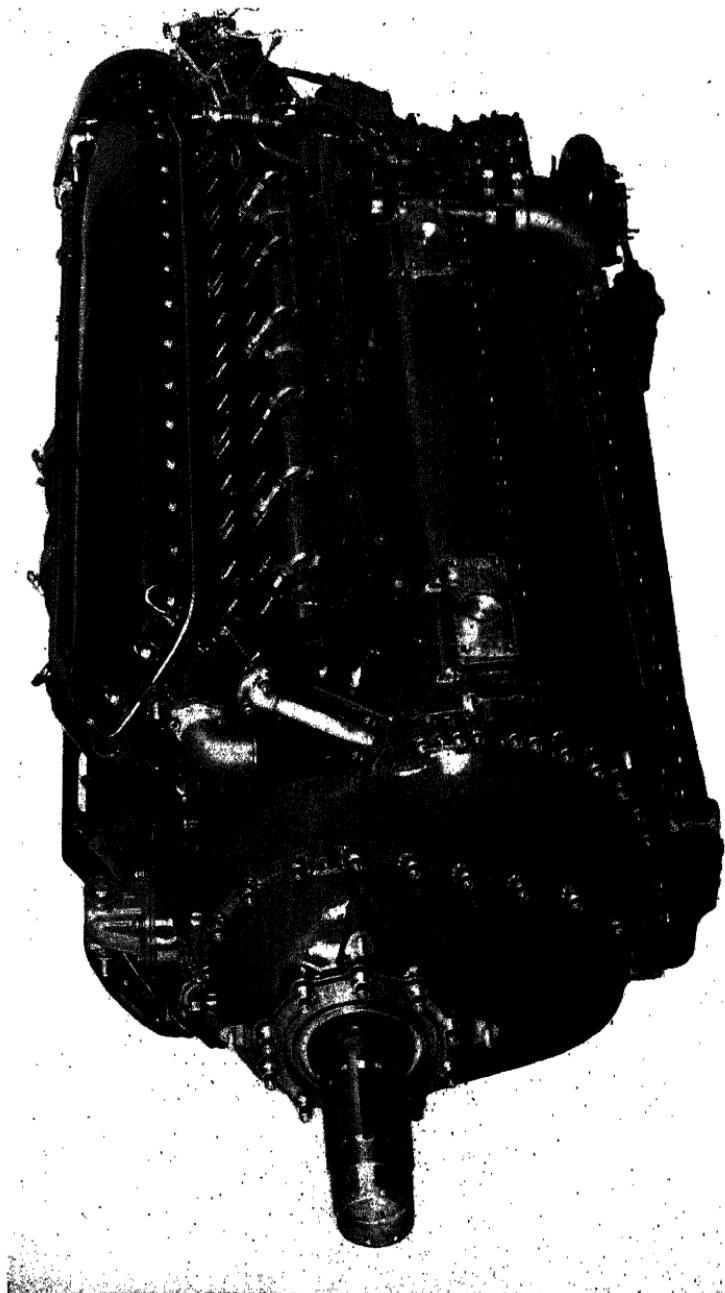
son 710-F

Allison V-1710-F

Model	V-1710-F17R (-89).
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.50:1.
Supercharger	Gear-driven 1-speed supercharger, ratio 8.1:1. General Electric turbo-supercharger with intercooler.
Carburation	1 Bendix-Stromberg PD-12K7 2-barrel injection type down-draft carburetor with automatic mixture control.
Ignition	1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 60-70 lb./sq.in. (4.2-4.9 kg/cm ²). Dry sump.
Starter	Eclipse 915 inertia and direct cranking electric starter.
Bore	5.50 in. 140 mm
Stroke	6.00 in. 152 mm
Displacement	1,710 cu.in. 28.0 lit
Compression ratio	6.65:1 6.65:1
Width	29.3 in. 745 mm
Height	36.7 in. 932 mm
Length	85.6 in. 2 174 mm
Frontal area	6.1 sq.ft. 0.57 m ²
Weight	1,350 lb. 612 kg
Weight/horsepower	0.94 lb./h.p. 0.43 kg/hp
Fuel consumption (cr.)	0.52 lb./h.p./hr. 235 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr. 11 g/hp/hr.
Gasoline grade	100/130 grade 100/130 grade
Oil grade (viscosity)	100-120 S.U. secs. 20.5-25.1 cs
Output/displacement	0.83 h.p./cu.in. 50.9 hp/lit
Output/piston area	5.04 h.p./sq.in. 0.78 hp/cm ²
Piston speed (max.)	3,000 ft./min. 15.2 m/sec
B.m.e.p. (max.)	219 lb./sq.in. 15.4 kg/cm ²
Rating (take-off)	1,425 h.p./3,000 r.p.m./54.0 in. (1 372 mm) Hg. boost
Rating (military)	1,425 h.p./3,000 r.p.m./27,000 ft. (8 200 m)
Rating (normal)	1,100 h.p./2,600 r.p.m./27,000 ft. (8 200 m)
Rating (max. cruising)	825 h.p./2,300 r.p.m./27,000 ft. (8 200 m)

V-1710-F17L (-91): Same as V-1710-F17R. Propeller shaft rotates in opposite direction.

*Additional models of Allison V-1710-F engines will be found on page 79.

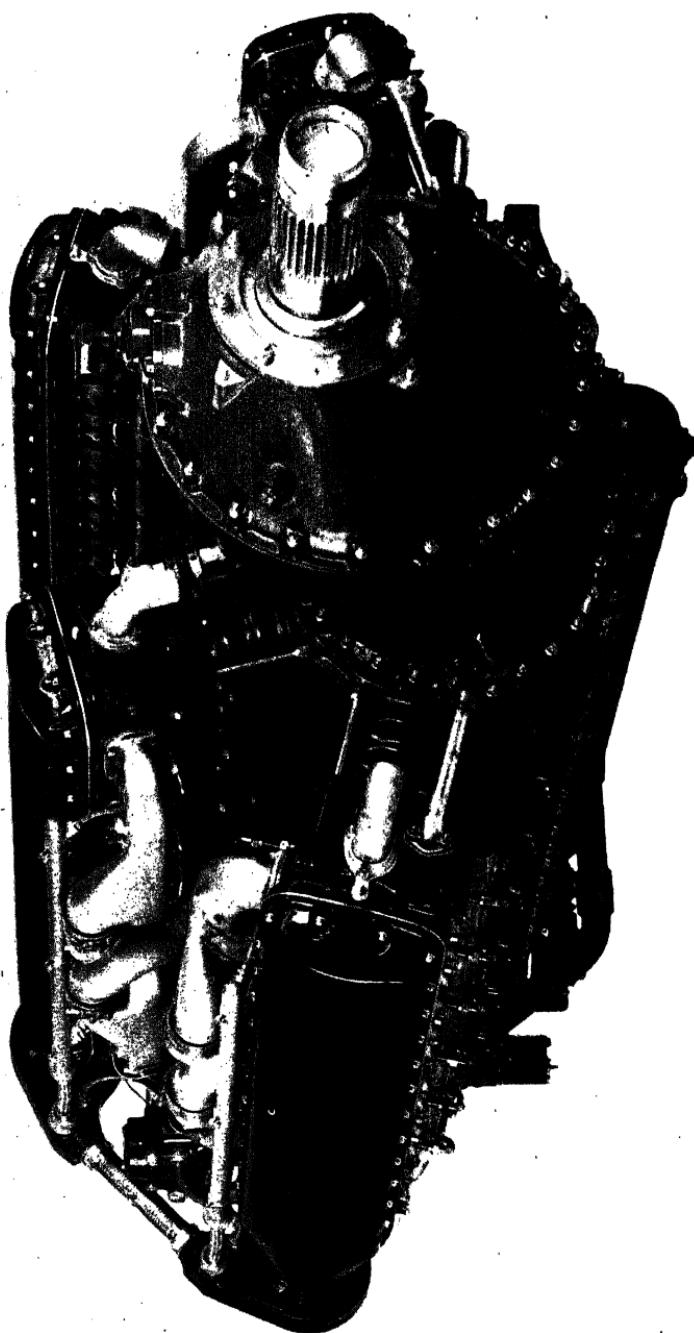


son V-17

Allison V-1710-F

Model	V-1710-F30R (-111).	
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.50:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 8.1:1. General Electric turbo-supercharger with intercooler.	
Carburation	1 Bendix-Stromberg PD-12K8 2-barrel injection type downdraft carburetor with automatic mixture control.	
Ignition	1 Bendix-Scintilla DFLN-5 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.	
Lubrication	Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm ²). Dry sump.	
Starter	Eclipse 915 inertia and direct cranking electric starter.	
Bore	5.50 in.	140 mm
Stroke	6.00 in.	152 mm
Displacement	1,710 cu.in.	28.0 lit
Compression ratio	6.65:1	6,65:1
Width	29.3 in.	745 mm
Height	37.6 in.	955 mm
Length	85.8 in.	2 179 mm
Frontal area	6.1 sq.ft.	0,57 m ²
Weight	1,395 lb.	633 kg
Weight/horsepower	0.95 lb./h.p.	0,43 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	245 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.86 h.p./cu.in.	52,7 hp/lit
Output/piston area	5.17 h.p./sq.in.	0,80 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	227 lb./sq.in.	16,0 kg/cm ²
Rating (take-off)	1,475 h.p./3,000 r.p.m./56.0 in. (1 422 m) Hg. boost	
Rating (military)	1,475 h.p./3,000 r.p.m./30,000 ft. (9 100 m)	
Rating (normal)	1,100 h.p./2,600 r.p.m./30,000 ft. (9 100 m)	
Rating (max. cruising)	825 h.p./2,300 r.p.m./30,000 ft. (9 100 m)	

V-1710-F30L (-113): Same as V-1710-F30R. Propeller shaft rotates in opposite direction.



on V-3420.

Allison V-3420-AModel **V-3420-A16R (-11).**

Type 24 cylinders, 2 vee 60 degrees groups with 30 degrees angle between them, ethylene glycol cooled, geared drive, supercharged, 4-cycle.

Construction 3-piece aluminum alloy crankcase with magnesium alloy sump. 4 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 2 6-throw 1-piece counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.32:1.

Supercharger Gear-driven 1-speed supercharger, ratio 6.9:1. General Electric turbo-supercharger with intercooler.

Carburation 1 Bendix-Stromberg PR-58B3 3-barrel injection type downdraft carburetor with automatic mixture control.

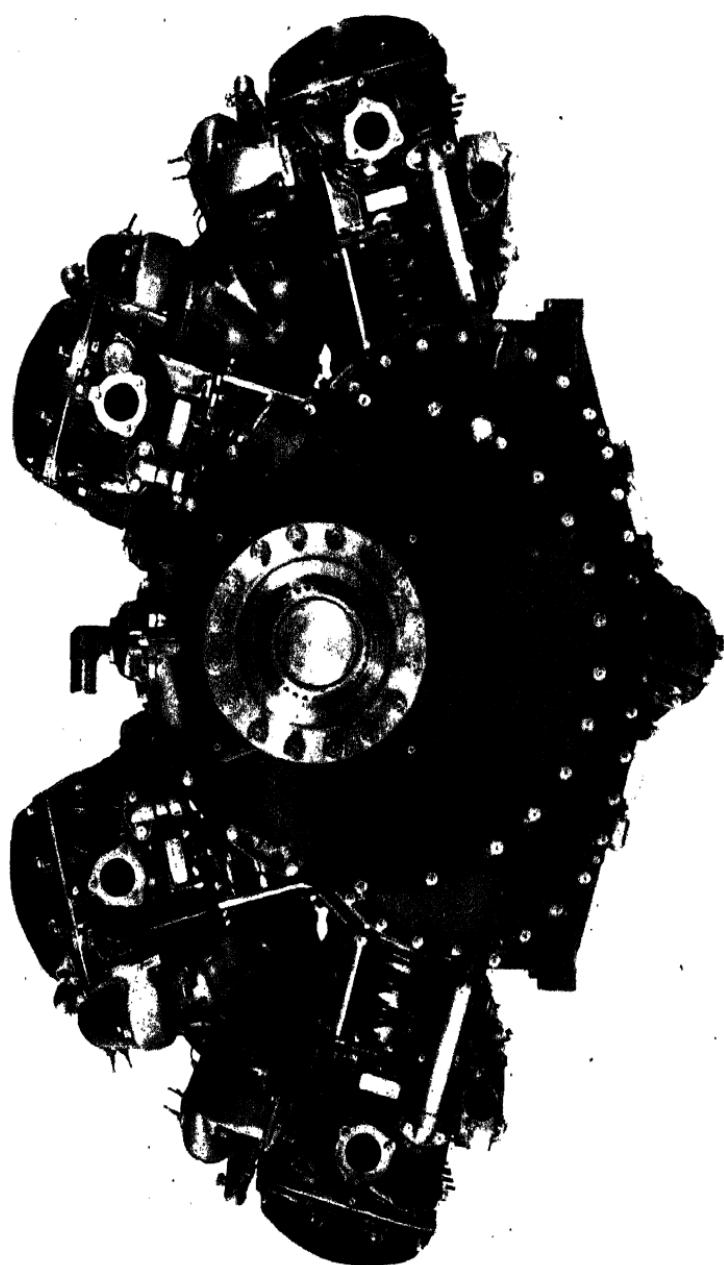
Ignition 2 Bendix-Scintilla DFLN-6 dual magnetos and 4 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.

Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump.

Starter Jack & Heintz JH-5EL electric inertia starter.

Bore	5.50 in.	140 mm
Stroke	6.00 in.	152 mm
Displacement	3,420 cu.in.	56,0 lit
Compression ratio	6.65:1	6,65:1
Width	60.0 in.	1 524 mm
Height	37.9 in.	963 mm
Length	95.9 in.	2 436 mm
Frontal area	11.6 sq.ft.	1,08 m ²
Weight	2,655 lb.	1 204 kg
Weight/horsepower	1.02 lb./h.p.	0,46 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.76 h.p./cu.in.	46,4 hp/lit
Output/piston area	4.56 h.p./sq.in.	0,71 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	201 lb./sq.in.	14,1 kg/cm ²
Rating (take-off)	2,600 h.p./3,000 r.p.m./46.0 in. (1 168 mm) Hg. boost	
Rating (military)	2,600 h.p./3,000 r.p.m./25,000 ft. (7 600 m)	
Rating (normal)	2,100 h.p./2,600 r.p.m./25,000 ft. (7 600 m)	
Rating (max. cruising)	1,575 h.p./2,300 r.p.m./25,000 ft. (7 600 m)	

V-3420-A16L (13): Similar to V-3420-A16R, but propeller shaft rotates in opposite direction. Gear-driven 1-speed supercharger, ratio 6.82:1. General Electric turbo-supercharger with intercooler.



3420

Additional Models of Allison V-1710-E Engines (1-stage)

(Continued from page 69)

V-1710-E4 (-35): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.55:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.

V-1710-E6 (-63): 1,325 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.

Additional Models of Allison V-1710-F Engines

(Continued from page 73)

V-1710-F2R (-27), -F2L (-29): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./25,000 ft. (7 600 m) military rating; 1,000 h.p./2,600 r.p.m./25,000 ft. (7 600 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 6.44:1. General Electric turbo-supercharger. 100/130 grade gasoline.

V-1710-F3R (-39): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.

V-1710-F4R (-73): 1,325 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.

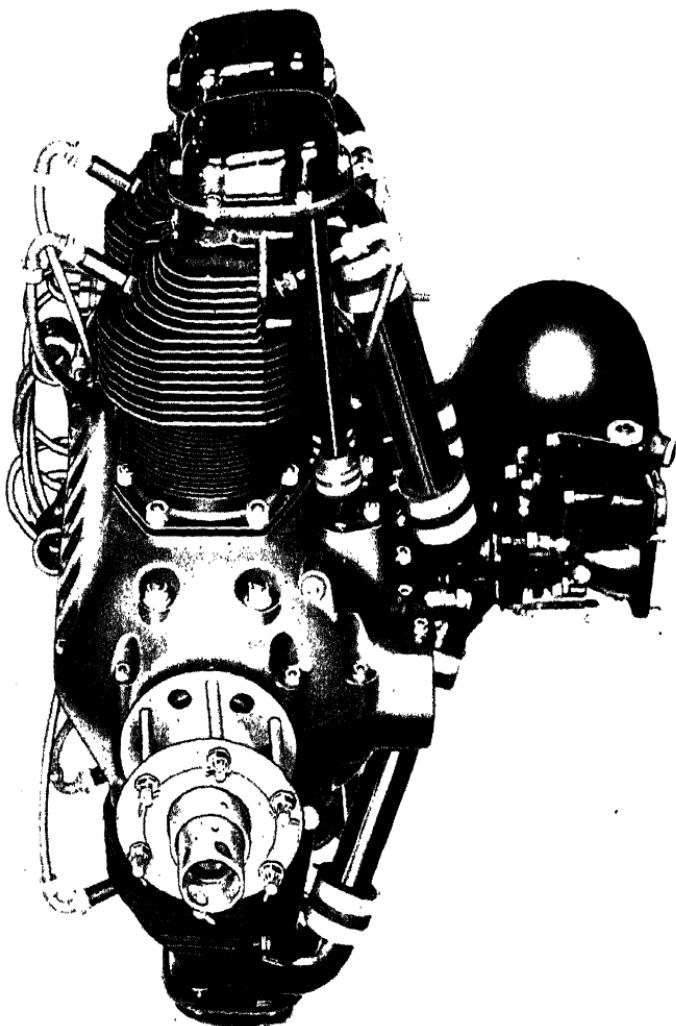
V-1710-F5R (-49), -F5L (-53): 1,325 h.p./3,000 r.p.m./take-off; 1,325 h.p./3,000 r.p.m./25,000 ft. (7 600 m) military rating; 1,000 h.p./2,600 r.p.m./25,000 ft. (7 600 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.48:1. General Electric turbo-supercharger. 100/130 grade gasoline.

V-1710-F10R (-51), -F10L (-55): Similar to V-1710-F5R, -F5L.

V-1710-F20R (-81): 1,200 h.p./3,000 r.p.m./take-off; 1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m) military rating; 1,000 h.p./2,600 r.p.m./14,000 ft. (4 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.60:1. 100/130 grade gasoline.

V-1710-F26R (-99): 1,200 h.p./3,000 r.p.m./take-off; 1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m) military rating; 955 h.p./2,600 r.p.m./15,700 ft. (4 800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.60:1. 100/130 grade gasoline.

V-1710-F21R (-87): 1,325 h.p./3,000 r.p.m./take-off; 1,325 h.p./3,000 r.p.m./3,000 ft. (900 m) military rating; 1,100 h.p./2,600 r.p.m./2,500 ft. (800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.48:1. 100/130 grade gasoline.



Continued 65

Continental A-65Model **A-65-8.**

Type 4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 205.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrel and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece crankshaft supported in 3 plain bearings.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-S3A1 updraft carburetor.

Ignition 2 Bendix-Scintilla SF4RN-8 magnetos. 2 18 mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 35 lb./sq.in. (2,5 kg/cm²). Wet sump.

Starter None.

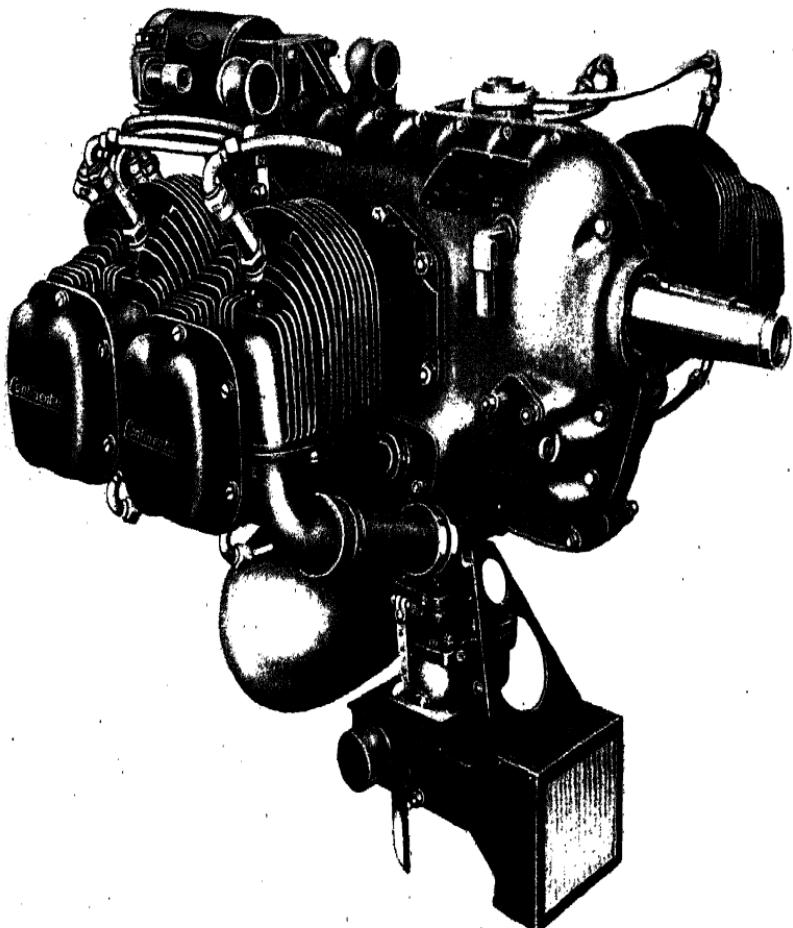
Bore	3.875 in.	98 mm
Stroke	3.625 in.	92 mm
Displacement	171 cu.in.	2,8 lit
Compression ratio	6.3:1	6.3:1
Width	31.5 in.	800 mm
Height	20.3 in.	516 mm
Length	30.4 in.	772 mm
Frontal area	2.7 sq.ft.	0,25 m ²
Weight	175 lb.	79 kg
Weight/horsepower	2.71 lb./h.p.	1,23 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.009 lb./h.p./hr.	4 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80 S.U. secs.	15,6 cs
Output/displacement	0.38 h.p./cu.in.	23,2 hp/lit
Output/piston area	1.38 h.p./sq.in.	0,21 hp/cm ²
Piston speed (max.)	1,340 ft./min.	7,0 m/sec
B.m.e.p. (max.)	131 lb./sq.in.	9,2 kg/cm ²

Rating (take-off) 65 h.p./2,300 r.p.m.

Rating (normal) 65 h.p./2,300 r.p.m./sea level

Rating (cruising) 55 h.p./2,150 r.p.m./sea level

A-50-8, A-50-9: 50 h.p./1,900 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 190.**A-65-9:** Same as A-65-8. A.T.C. 205.**A-75-8, A-75-9:** 75 h.p./2,600 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 213.**A-80-8, A-80-9:** 80 h.p./2,700 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 80-octane gasoline. A.T.C. 217.



Continental C-75

Continental C-75Model **C-75-12.**

Type 4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 233.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece crankshaft supported in 3 plain bearings.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-S3A1 updraft carburetor.

Ignition 2 Bendix-Scintilla SF4RN-8 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 35 lb./sq.in. (2,5 kg/cm²). Wet sump.

Starter Delco-Remy 30112 electric starter.

Bore	4.0625 in.	103 mm
Stroke	3.625 in.	92 mm
Displacement	188 cu.in.	3,1 lit
Compression ratio	6.3:1	6.3:1
Width	31.6 in.	802 mm
Height	21.2 in.	538 mm
Length	31.5 in.	800 mm
Frontal area	2.7 sq.ft.	0,25 m ²
Weight	186 lb.	84 kg
Weight/horsepower	2.48 lb./h.p.	1,12 kg/hp
Fuel consumption (cr.)	0.56 lb./h.p./hr.	255 g/hp/hr
Oil consumption (cr.)	0.010 lb./h.p./hr.	4,5 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80 S.U. secs.	15,6 cs
Output/displacement	0.40 h.p./cu.in.	24,2 hp/lit
Output/piston area	1.45 h.p./sq.in.	0.23 hp/cm ²
Piston speed (max.)	2,719 ft./min.	6,9 m/sec
B.m.e.p. (max.)	141 lb./sq.in.	9,9 kg/cm ²

Rating (take-off) 75 h.p./2,250 r.p.m.

Rating (normal) 75 h.p./2,250 r.p.m./sea level

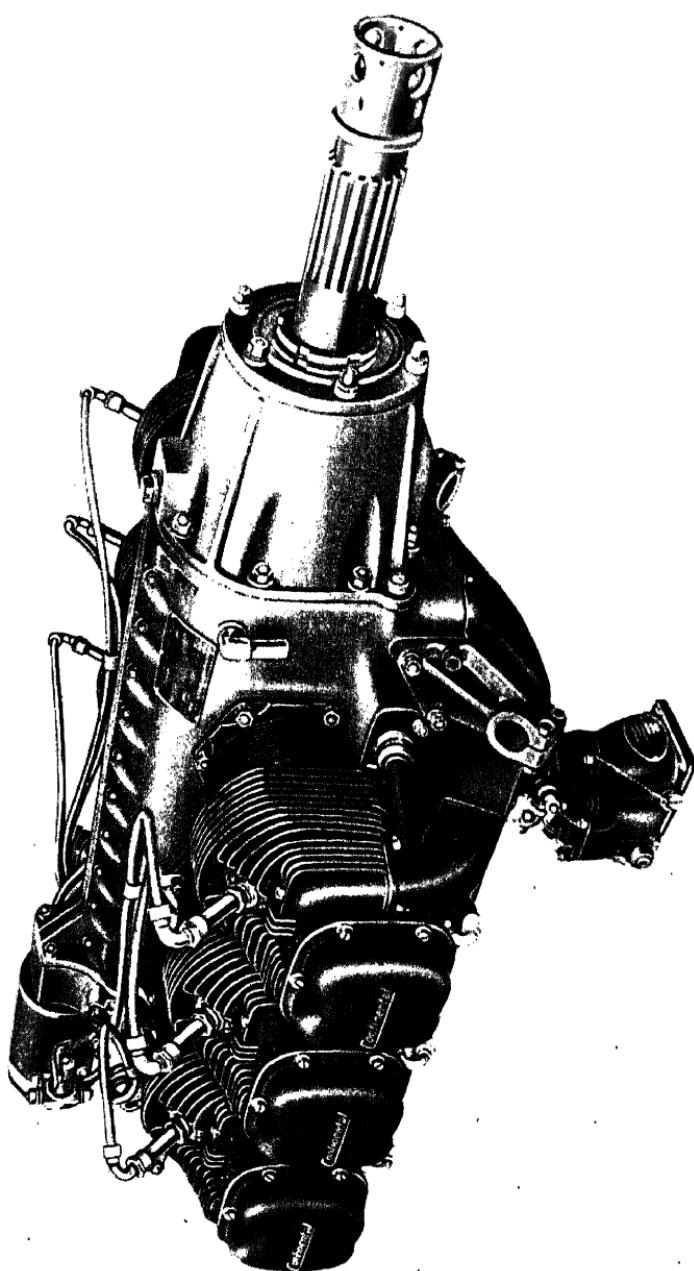
Rating (cruising) 65 h.p./2,025 r.p.m./sea level

C-75-10: Same as C-75-12. No starter. A.T.C. pending.

C-75-11: Same as C-75-12. Hummer electric starter. A.T.C. pending.

C-85-12: 85 h.p./2,550 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. A.T.C. pending.

AIRCRAFT ENGINES OF THE WORLD



Con C-140

Continental C-140Model **C-140-1.**

Type 6 cylinders, horizontally opposed, air cooled, geared drive, not supercharged, 4-cycle. A.T.C. pending.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 3 plain bearings. Planetary reduction gear, ratio 0.62:1.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-R4B updraft carburetor.

Ignition 2 Bendix-Scintilla SF6LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 40 lb./sq.in. (2,8 kg/cm²). Wet sump.

Starter Delco-Remy 41186 electric starter.

Bore	4.0625 in.	103 mm
Stroke	3.625 in.	92 mm
Displacement	282 cu.in.	4,6 lit
Compression ratio	6.3:1	6,3:1
Width	31.5 in.	800 mm
Height	24.7 in.	628 mm
Length	46.7 in.	1 186 mm
Frontal area	2.7 sq.ft.	0.25 m ²
Weight	298 lb.	135 kg
Weight/horsepower	2.13 lb./h.p.	0.97 kg/hp
Fuel consumption (cr.)	0.55 lb./h.p./hr.	250 g/hp/hr
Oil consumption (cr.)	0.017 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80 S.U. secs.	15,6 cs
Output/displacement	0.49 h.p./cu.in.	30,4 hp/lit
Output/piston area	1.80 h.p./sq.in.	0,28 hp/cm ²
Piston speed (max.)	1,812 ft./min.	9,2 m/sec
B.m.e.p. (max.)	129 lb./sq.in.	9,1 kg/cm ²

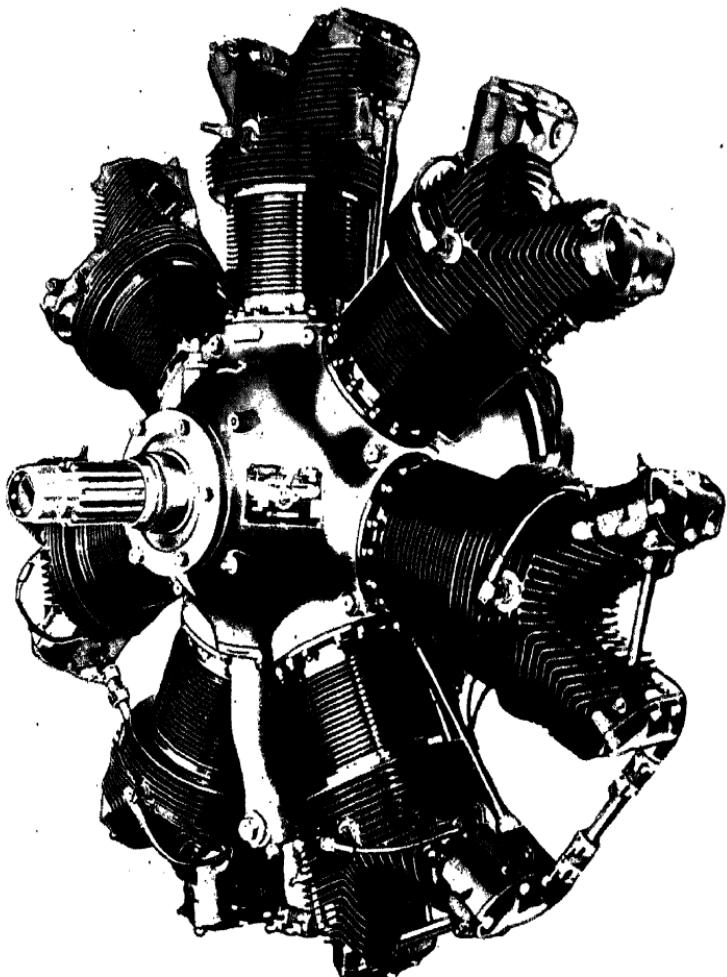
Rating (take-off) 140 h.p./3,000 r.p.m.

Rating (normal) 140 h.p./3,000 r.p.m./sea level

Rating (cruising) 102 h.p./2,700 r.p.m./sea level

C-115-1: 115 h.p./2,350 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. pending.

C-125-1: Similar to C-115-1. 125 h.p./2,580 r.p.m./take-off and normal rating at sea level. A.T.C. pending.



Continental W-670

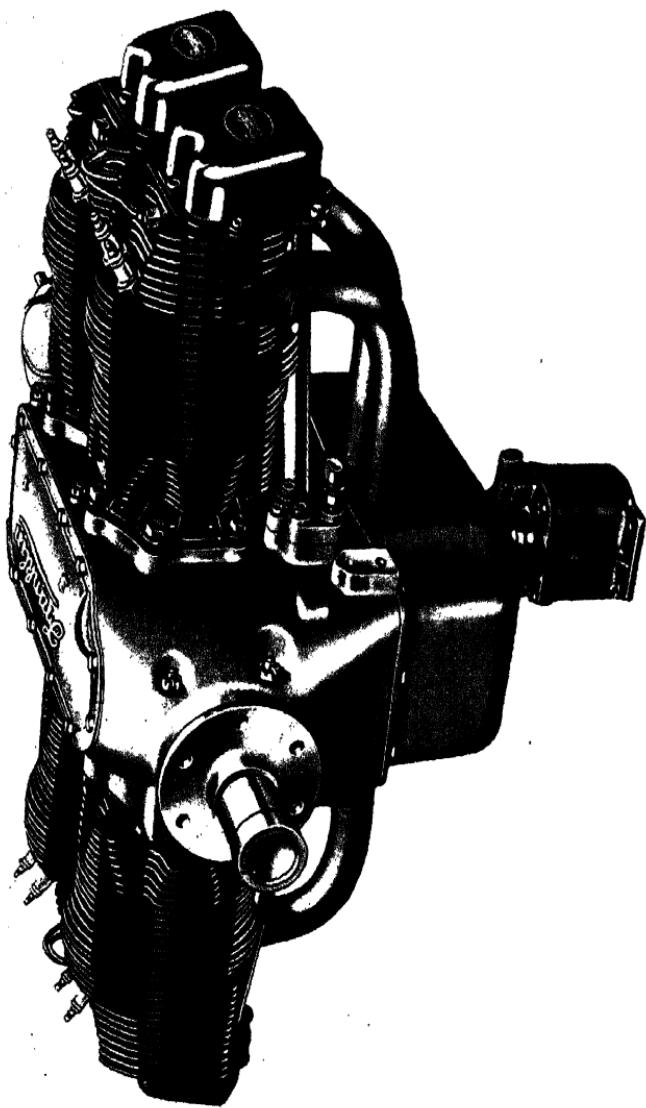
Continental W-670

Model	W-670-M.
Type	7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle A.T.C. 162.
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 ball bearings.
Supercharger	None.
Carburation	1 Bendix-Stromberg NA-R6 updraft carburetor.
Ignition	2 Bendix-Scintilla VMN7-DF magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 70-80 lb./sq.in. (4,9 - 5,6 kg/cm ²). Dry sump.
Starter	Eclipse E-160 direct cranking electric starter.
Bore	5,125 in. 130 mm
Stroke	4,625 in. 117 mm
Displacement	668 cu.in. 10,9 lit
Compression ratio	6,1:1 6,1:1
Diameter	42,2 in. 1 072 mm
Length	34,2 in. 869 mm
Frontal area	9,7 sq.ft. 0,90 m ²
Weight	450 lb. 204 kg
Weight/horsepower	1,87 lb./h.p. 0,84 kg/hp
Fuel consumption (cr.)	0,49 lb./h.p./hr. 220 g/hp/hr
Oil consumption (cr.)	0,025 lb./h.p./hr. 11 g/hp/hr
Gasoline grade	80 octane 80 octane
Oil grade (viscosity)	60-120 S.U. secs. 10,3 - 25,1 cs
Output/displacement	0,36 h.p./cu.in. 22,0 hp/lit
Output/piston area	1,66 h.p./sq.in. 0,26 hp/cm ²
Piston speed (max.)	1,696 ft./min. 8,6 m/sec
B.m.e.p. (max.)	130 lb./sq.in. 9,1 kg/cm ²
Rating (take-off)	240 h.p./2,200 r.p.m.
Rating (normal)	240 h.p./2,200 r.p.m./sea level
Rating (cruising)	202 h.p./2,075 r.p.m./sea level

W-670-6A (R-670-5): 220 h.p./2,075 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 162.

W-670-K: 225 h.p./2,175 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 162.

W-670-N (R-670-4): Same as W-670-6A. Military engine.



Frank 4AC 76

Franklin 4AC-176

Model 4AC-176-BA2.

Type 4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 221.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 3 plain bearings.

Supercharger None.

Carburation 1 Marvel-Schebler MA-3P updraft carburetor.

Ignition 2 Eisemann AM-4 or LA-4 magnetos. 2 14-mm short reach spark plugs per cylinder.

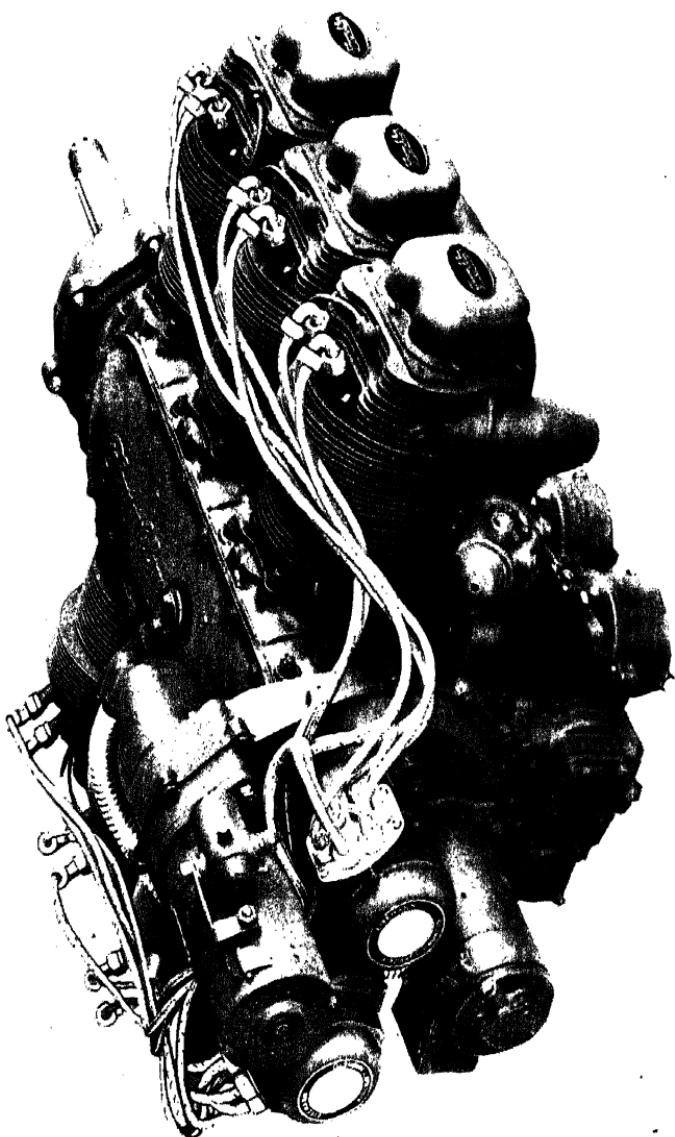
Lubrication Pressure feed, 35-45 lb./sq.in. (2,5 - 3,2 kg/cm²). Wet sump.

Starter None.

Bore	4.00 in.	102 mm
Stroke	3.50 in.	89 mm
Displacement	176 cu.in.	2,9 lit
Compression ratio	6.0:1	6,0:1
Width	30.2 in.	767 mm
Height	20.0 in.	508 mm
Length	28.6 in.	726 mm
Frontal area	2.3 sq.ft.	0,21 m ²
Weight	182 lb.	83 kg
Weight/horsepower	2.80 lb./h.p.	1,28 kg/hp
Fuel consumption (cr.)	0.49 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.003 lb./h.p./hr.	1,4 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	40 S.U. secs.	4,3 cs
Output/displacement	0.37 h.p./cu.in.	22,4 hp/lit
Output/piston area	1.29 h.p./sq.in.	0,20 hp/cm ²
Piston speed (max.)	1,382 ft./min.	6,8 m/sec
B.m.e.p. (max.)	127 lb./sq.in.	8,9 kg/cm ²
Rating (take-off)	65 h.p./2,300 r.p.m.	
Rating (normal)	65 h.p./2,300 r.p.m./sea level	
Rating (cruising)	49 h.p./2,050 r.p.m./sea level	

4AC-176-BA3: Same as 4AC-176-BA2. Auto-Lite or Delco-Remy electric starter and generator. A.T.C. 221.

Manufactured by Aircooled Motors Corporation.



Fra

6ACG-298

Franklin 6AC-298

Model 6ACG-298-H3.

Type 6 cylinders, horizontally opposed, air cooled, geared drive, not supercharged, 4-cycle. A.T.C. pending.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. Planetary reduction gear, ratio 0.63:1.

Supercharger None.

Carburation 2 Marvel-Schebler MA-3A updraft carburetors.

Ignition 2 Eisemann LA-6 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

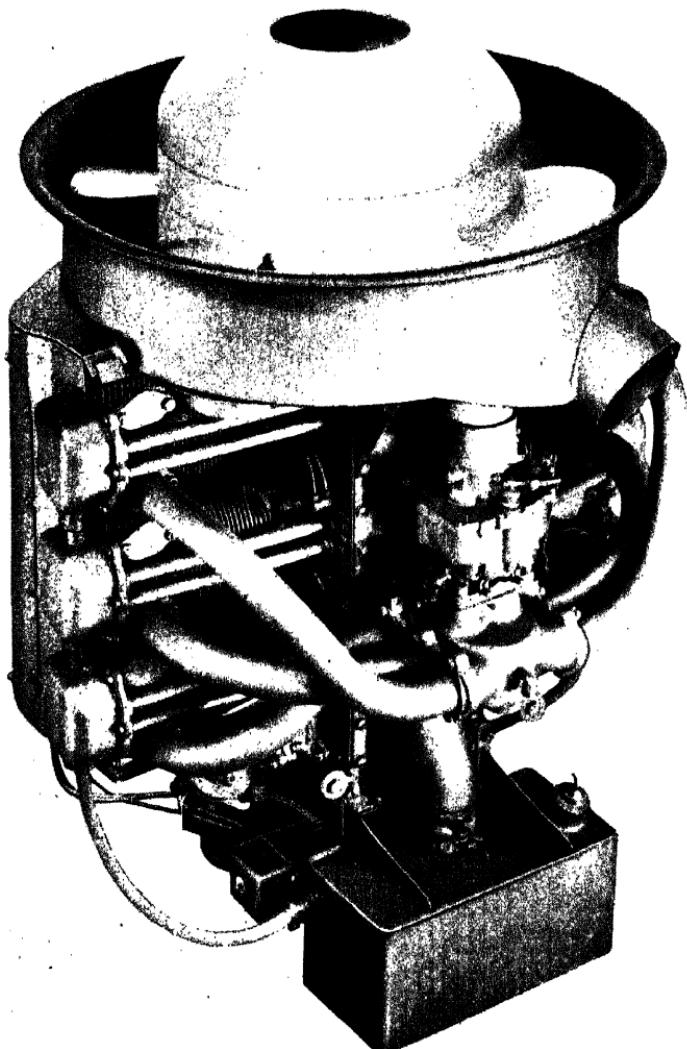
Lubrication Pressure feed, 35-45 lb./sq.in. (2,5-3,2 kg/cm²). Wet sump.

Starter Auto-Lite or Delco-Remy electric starter.

Bore	4.25 in.	108 mm
Stroke	3.50 in.	89 mm
Displacement	298 cu.in.	4,9 lit
Compression ratio	7.0:1	7,0:1
Width	30.2 in.	767 mm
Height	24.6 in.	625 mm
Length	43.7 in.	1 110 mm
Frontal area	2.8 sq.ft.	0,26 m ²
Weight	340 lb.	154 kg
Weight/horsepower	2.06 lb./h.p.	0,98 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.003 lb./h.p./hr.	1,4 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	40 S.U. secs.	4,3 cs
Output/displacement	0.54 h.p./cu.in.	32,6 hp/lit
Output/piston area	1.88 h.p./sq.in.	0,29 hp/cm ²
Piston speed (max.)	1,487 ft./min.	9,5 m/sec
B.m.e.p (max.)	134 lb./sq.in.	9,4 kg/cm ²
Rating (take-off)	160 h.p./3,200 r.p.m.	
Rating (normal)	160 h.p./3,200 r.p.m./sea level	
Rating (cruising)	124 h.p./2,880 r.p.m./sea level	

6AC-298-F3: 130 h.p./2,550 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 80-octane gasoline. A.T.C. 225.

Manufactured by Aircooled Motors Corporation.



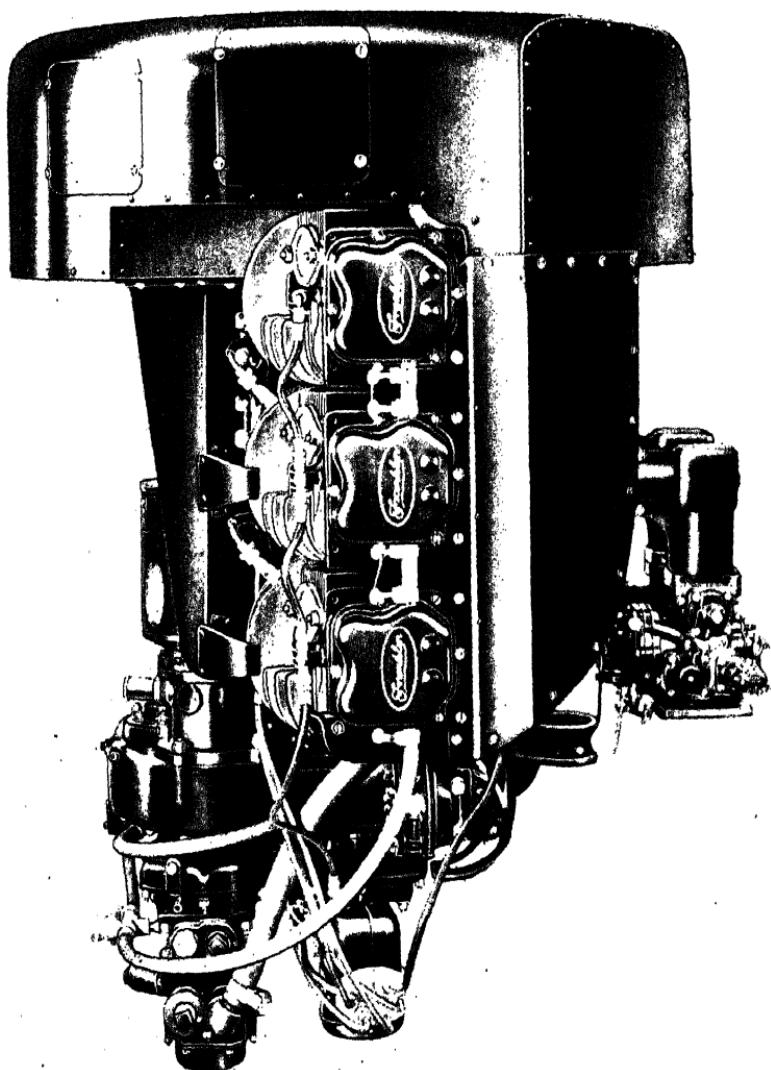
Franklin 6ACV-298 (Helicopter)

Franklin 6ACV-298 (Helicopter)

Model	6ACV-298.
Type	6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. pending.
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. 6-blade fan on top of engine driven at crankshaft speed for cooling purposes.
Supercharger	None.
Carburation	1 Bendix-Stromberg AAV-2 downdraft carburetor.
Ignition	2 Eisemann LA-6 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 35-45 lb./sq.in. (2,5-3,2 kg/cm ²). Dry sump.
Starter	Auto-Lite or Delco-Remy electric starter.
Bore	4.25 in. 108 mm
Stroke	3.50 in. 89 mm
Displacement	298 cu.in. 4,9 lit
Compression ratio	7.0:1 7,0:1
Width (across valve covers)	30.6 in. 777 mm
Width (across carburetors)	25.5 in. 684 mm
Height (vertical)	36.5 in. 927 mm
Weight (including cooling)	313 lb. 142 kg
Weight/horsepower	1.96 lb./h.p. 0,89 kg/hp
Fuel consumption (cr.)	0.52 lb./h.p./hr. 235 g/hp/hr
Oil consumption (cr.)	0.012 lb./h.p./hr. 5 g/hp/hr
Gasoline grade	80 octane 80 octane
Oil grade (viscosity)	120 S.U. secs. 25,1 cs
Output/displacement	0.54 h.p./cu.in. 32,6 hp/lit
Output/piston area	1.88 h.p./sq.in. 0,29 hp/cm ²
Piston speed (max.)	1,896 ft./min. 9,6 m/sec
B.m.e.p. (max.)	132 lb./sq.in. 9,3 kg/cm ²
Rating (take-off)	160 h.p./3,250 r.p.m.
Rating (normal)	160 h.p./3,250 r.p.m./sea level
Rating (cruising)	120 h.p./2,960 r.p.m./sea level

Note: This engine is designed for vertical installation in helicopters.

Manufactured by Aircooled Motors Corporation.



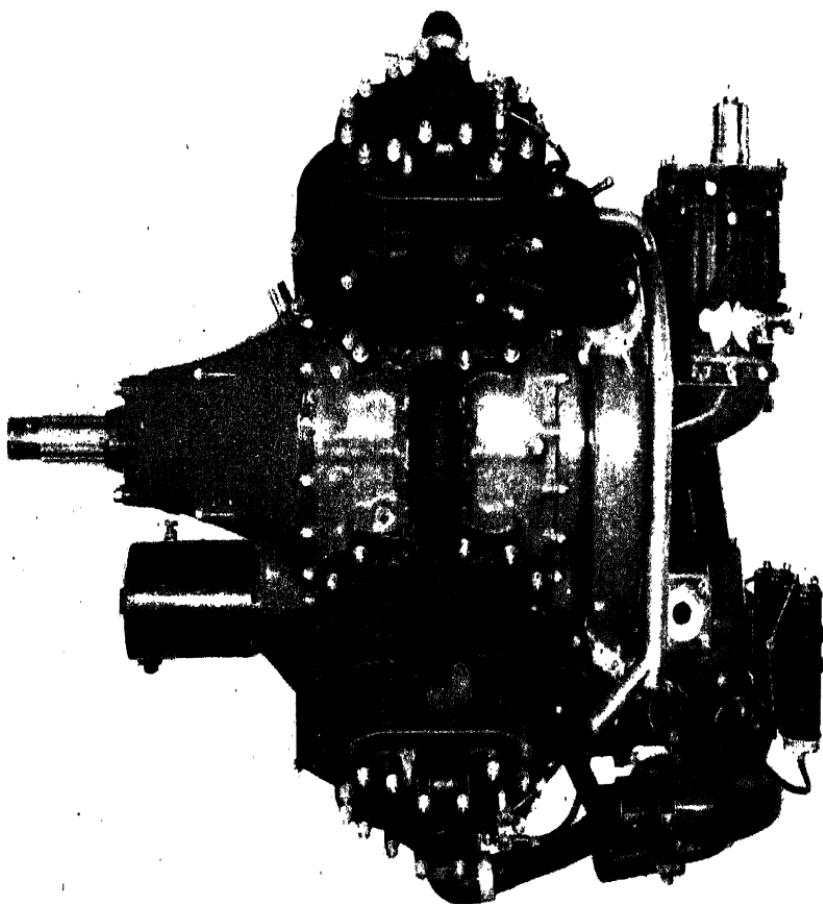
Franklin 6ACV-403 (Helicopter)

Franklin 6ACV-403 (Helicopter)

Model	6ACV-403.
Type	6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. Approved by A.A.F.
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. 6-blade fan on top of engine driven at crankshaft speed for cooling purposes.
Supercharger.....	None.
Carburation	2 Bendix-Stromberg PS-5C pressure type updraft carburetors.
Ignition.....	2 Eisemann LA-6 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 45-60 lb./sq.in. (3,0 - 4,2 kg/cm ²). Dry sump.
Starter	Delco-Remy 108567-541 vertical geared electric starter.
Bore	4.625 in. 117 mm
Stroke	4.00 in. 102 mm
Displacement	403 cu.in. 6,6 lit
Compression ratio.....	7.0:1 7,0:1
Width (across valve covers)	33.2 in. 843 mm
Width (across carburetors)	33.7 in. 856 mm
Height (vertical)	43.4 in. 1 102 mm
Weight (including cooling)	458 lb. 208 kg
Weight/horsepower.....	1.87 lb./h.p. 0,85 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr. 225 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr. 7 g/hp/hr
Gasoline grade	80 octane 80 octane
Oil grade (viscosity)	120 S.U. secs. 25,1 cs
Output/displacement	0.61 h.p./cu.in. 37,1 hp/lit
Output/piston area	2.40 h.p./sq.in. 0,37 hp/cm ²
Piston speed (max.)	2,183 ft./min. 11,1 m/sec
B.m.e.p. (max.)	147 lb./sq.in. 10,3 kg/cm ²
Rating (take-off)	245 h.p./3,275 r.p.m.
Rating (normal)	245 h.p./3,275 r.p.m./sea level
Rating (cruising)	190 h.p./3,050 r.p.m./sea level

Note: This engine is designed for vertical installation in helicopters.

Manufactured by Aircooled Motors Corporation.

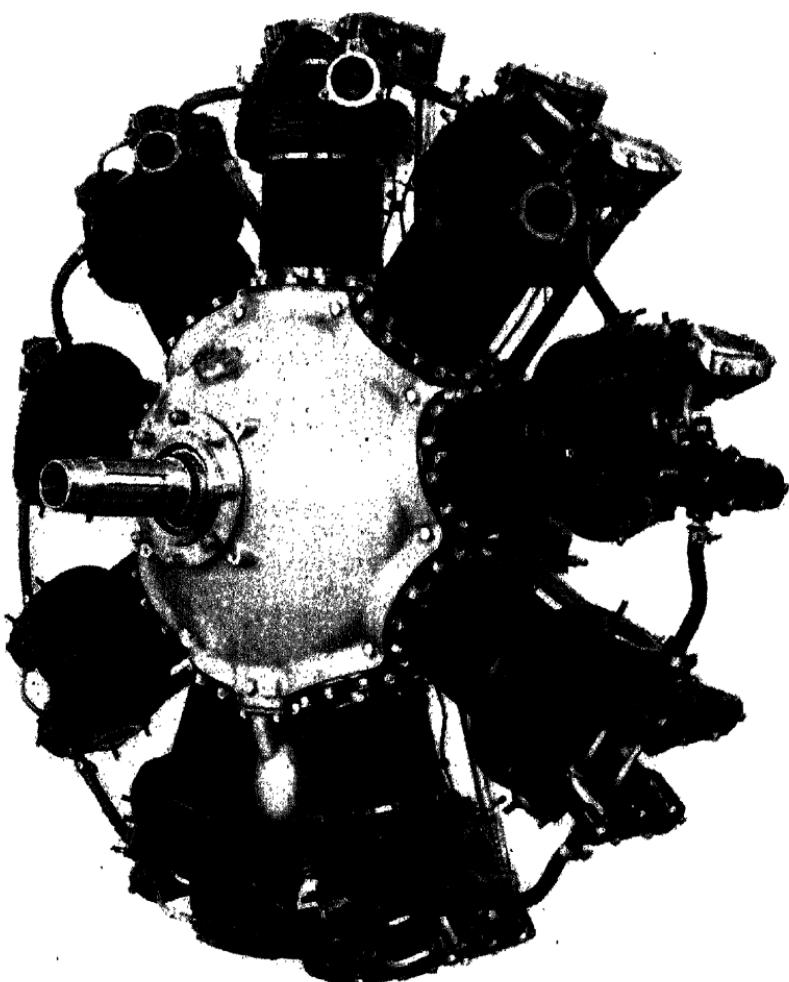


General Motors Research X-250

General Motors Research X-250

Model	X-250-D (experimental).
Type	4 (8) cylinders, X 90 degrees, liquid cooled, direct drive, ground boosted, 2-cycle. A.T.C. pending.
Construction	1-piece barrel type aluminum alloy crankcase. 4 aluminum alloy cylinder blocks each containing 2 cylinder bores with a common combustion chamber. Steel cylinder liners. Detachable cylinder heads for each cylinder block. Piston-controlled inlet ports and exhaust ports around bottom of each cylinder block. 2-throw 1-piece crankshaft supported in 2 plain bearings and 1 thrust bearing. 8 slipper type connecting rods.
Supercharger	Gear-driven ground blower for scavenging, ratio 8.37:1.
Carburation	1 General Motors Research downdraft carburetor.
Ignition	1 Delco-Remy battery and coil with 2 4-point distributors. 2 14-mm short reach spark plugs per cylinder.
Lubrication	Pressure feed, 25 lb./sq.in. (1,7 kg/cm ²). Dry sump.
Starter	Delco-Remy electric starter.
Bore	3.0625 in. 78 mm
Stroke	4.281 in. 109 mm
Displacement	250 cu.in. 4,1 lit
Compression ratio	7.4:1 7,4:1
Width	27.7 in. 704 mm
Height	31.0 in. 787 mm
Length	41.4 in. 1 051 mm
Frontal area	6.0 sq.ft. 0,56 m ²
Weight	275 lb. 125 kg
Weight/horsepower	1.37 lb./h.p. 0,62 kg/hp
Fuel consumption (cr.)	0.58 lb./h.p./hr. 265 g/hp/hr
Oil consumption (cr.)	0.0025 lb./h.p./hr. 1 g/hp/hr
Gasoline grade	91/96 grade 91/96 grade
Oil grade (viscosity)	60 S.U. secs. 10,3 cs
Output/displacement	0.80 h.p./cu.in. 48,8 hp/lit
Output/piston area	3.39 h.p./sq.in. 0,52 hp/cm ²
Piston speed (max.)	1,783 ft./min. 9,1 m/sec
B.m.e.p. (max.)	127 lb./sq.in. 8,9 kg/cm ²
Rating (take-off)	200 h.p./2,500 r.p.m.
Rating (normal)	200 h.p./2,500 r.p.m./sea level
Rating (cruising)	150 h.p./2,250 r.p.m./sea level

AIRCRAFT ENGINES OF THE WORLD



Guiberson A-1020 (Diesel)

Guiberson A-1020 (Diesel)

Model A-1020.

Type 9 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 220.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger None.

Injection Direct fuel injection. 1 Guiberson 1-plunger injection pump and 1 Guiberson closed-type 3-orifice injector per cylinder. Injection pressure 2,500 lb./sq.in. (175 kg/cm²).

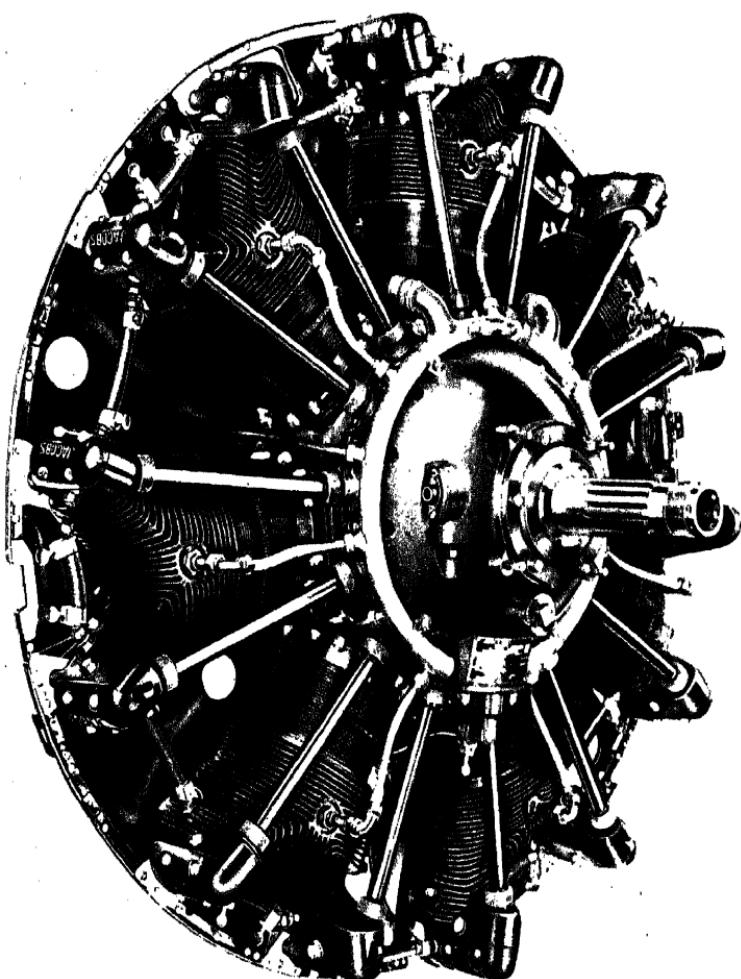
Ignition Compression.

Lubrication Pressure feed, 95 lb./sq.in. (6,7 kg/cm²). Dry sump.

Starter Breeze L-4A cartridge starter.

Bore	.....	5.125 in.	130 mm
Stroke	.....	5.50 in.	140 mm
Displacement	.....	1,021 cu.in.	16,7 lit
Compression ratio	.....	14.0:1	14,0:1
Diameter	.....	47.1 in.	1 197 mm
Length	.....	38.6 in.	980 mm
Frontal area	.....	12.1 sq.ft.	1,12 m ²
Weight	.....	653 lb.	296 kg
Weight/horsepower	.....	2.10 lb./h.p.	0,95 kg/hp
Fuel consumption (cr.)	.....	0.37 lb./h.p./hr.	170 g/hp/hr
Oil consumption (cr.)	.....	0.008 lb./h.p./hr.	4 g/hp/hr
Fuel oil grade	.....	50-53 cetane	50-53 cetane
Lub. oil grade (viscosity)	.....	100 S.U. secs.	20,5 cs
Output/displacement	.....	0.30 h.p./cu.in.	20,5 hp/lit
Output/piston area	.....	1.67 h.p./sq.in.	0,26 hp/cm ²
Piston speed (max.)	.....	1,971 ft./min.	10,0 m/sec
B.m.e.p. (max.)	.....	112 lb./sq.in.	7,8 kg/cm ²
Rating (take-off)	.....	310 h.p./2,150 r.p.m.	
Rating (normal)	.....	310 h.p./2,150 r.p.m./sea level	
Rating (cruising)	.....	220 h.p./1,900 r.p.m./sea level	

This engine was test-flown in 1940. It is similar to the Guiberson T-1020 Diesel used in United States Army tanks.



Jacobs R-755

Jacobs R-755Model **R-755A1 (L-4MB).**

Type 7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-R7A updraft carburetor.

Ignition 1 Bendix-Scintilla VMN7-DF5 magneto and 1 Bendix-Scintilla WL-7A battery distributor and coil. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3, kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter.

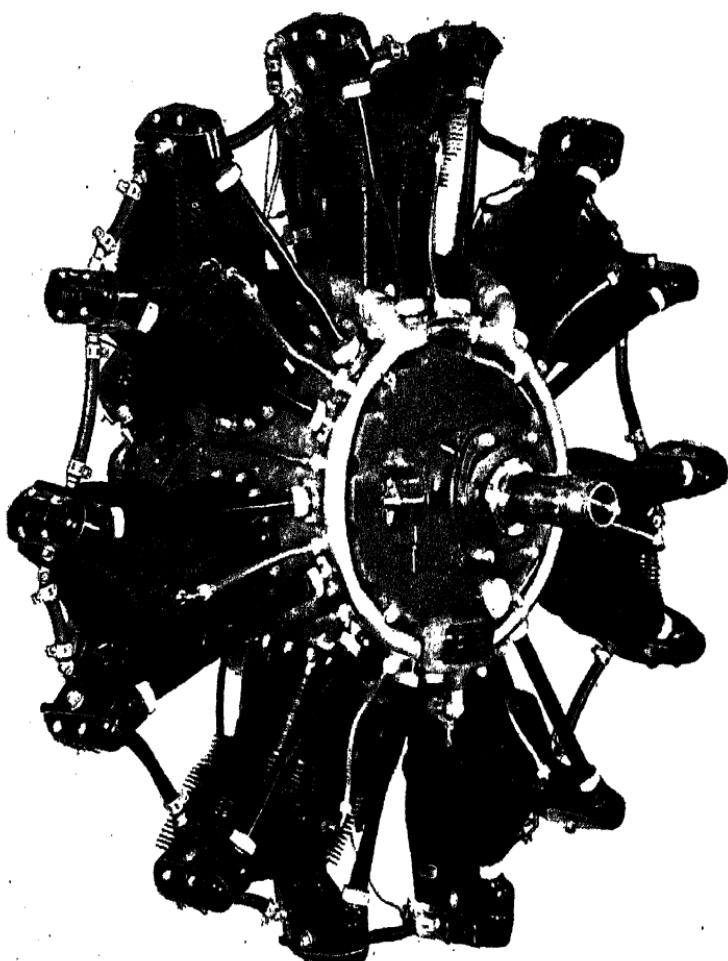
Bore	5.25 in.	133 mm
Stroke	5.00 in.	127 mm
Displacement	757 cu.in.	12,4 lit
Compression ratio	5.4:1	5,4:1
Diameter	44.0 in.	1 118 mm
Length	40.2 in.	1 021 mm
Frontal area	10.5 sq.ft.	0,98 m ²
Weight	505 lb.	229 kg
Weight/horsepower	2.06 lb./h.p.	0,93 kg/hp
Fuel consumption (cr.)	0.53 lb./h.p./hr.	240 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.29 h.p./cu.in.	18,1 hp/lit
Output/piston area	1.48 h.p./sq.in.	0,23 hp/cm ²
Piston speed (max.)	1,667 ft./min.	8,5 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	8,3 kg/cm ²

Rating (take-off) 245 h.p./2,200 r.p.m.

Rating (normal) 225 h.p./2,000 r.p.m./sea level

Rating (cruising) 160 h.p./1,900 r.p.m./sea level

R-755A3 (L-4M): Same as R-755A1. 2 magnetos. A.T.C. 121.**L-4MA7:** Similar to R-755A3. Geared autogiro rotor drive on rear accessory housing. A.T.C. 121.



Jacobs R-915

Jacobs R-915Model **R-915A1 (L-6MB).**

Type 7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 195.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads, 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-R7A updraft carburetor.

Ignition 1 Bendix-Scintilla VMN7-DF5 magneto and 1 Bendix-Scintilla WL-7A battery distributor and coil. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3 kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter.

Bore	.....	5.50 in.	140 mm
Stroke	.....	5.50 in.	140 mm
Displacement	.....	914 cu.in.	15,0 lit
Compression ratio	.....	6.0:1	6,0:1
Diameter	.....	45.6 in.	1 158 mm
Length	.....	40.1 in.	1 018 mm
Frontal area	.....	11.4 sq.ft.	1,06 m ²
Weight	.....	555 lb.	252 kg
Weight/horsepower	.....	1.68 lb./h.p.	0,76 kg/hp
Fuel consumption (cr.)	.....	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	.....	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	.....	80 octane	80 octane
Oil grade (viscosity)	.....	100 S.U. secs.	20,5 cs
Output/displacement	.....	0.36 h.p./cu.in.	22,0 hp/lit
Output/piston area	.....	1.98 h.p./sq.in.	0,31 hp/cm ²
Piston speed (max.)	.....	2,017 ft./min.	10,1 m/sec
B.m.e.p. (max.)	.....	130 lb./sq.in.	9,1 kg/cm ²

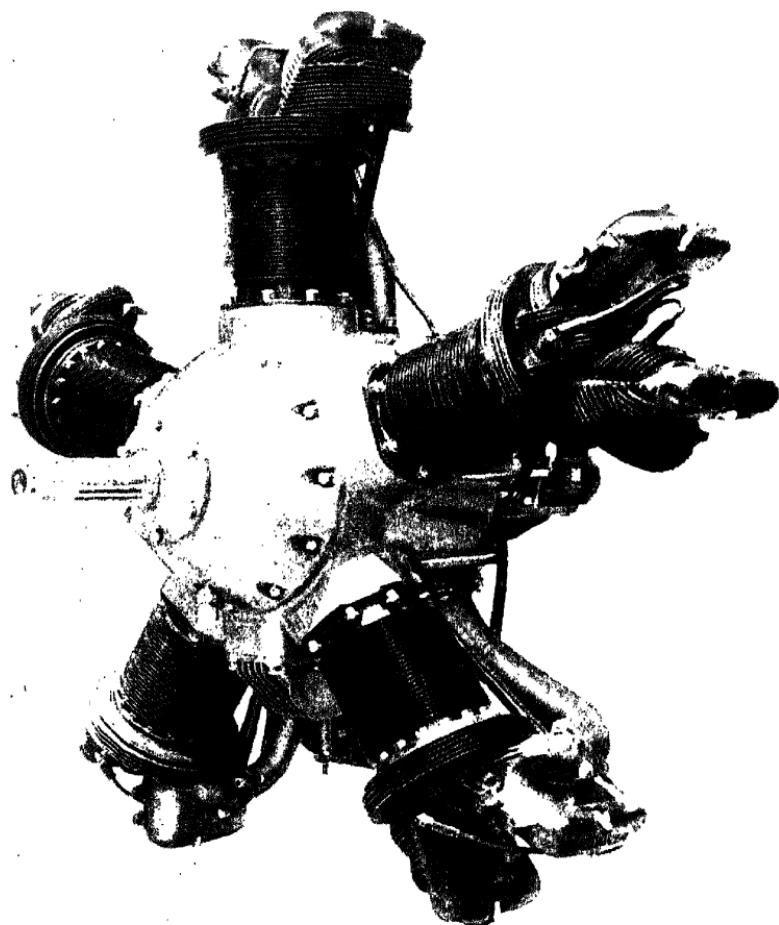
Rating (take-off) 330 h.p./2,200 r.p.m.

Rating (normal) 300 h.p./2,100 r.p.m./sea level

Rating (cruising) 210 h.p./1,900 r.p.m./sea level

R-915A3 (L-6M): Same as R-915A1. 2 magnetos. A.T.C. 195.**R-915A4 (L-6MBA):** Similar to R-915A1. Geared autogiro rotor drive on rear accessory housing. A.T.C. 195.**L-6MA:** Similar to R-915A3. Geared autogiro rotor drive on rear accessory housing. A.T.C. 195.

AIRCRAFT ENGINES OF THE WORLD



Kinner B-5

Kinner B-5Model **B-54.**

Type 5 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 51.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Splined propeller shaft.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-R5A or Holley 419 updraft carburetor.

Ignition 2 Bendix-Scintilla SB5LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 100 lb./sq.in. (7,0 kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter or Eclipse 390 hand starter.

Bore	4.625 in.	117 mm
Stroke	5.25 in.	133 mm
Displacement	441 cu.in.	7,2 lit
Compression ratio	5.25:1	5,25:1
Diameter	45.4 in.	1 153 mm
Length	33.6 in.	853 mm
Frontal area	11.2 sq.ft.	1,04 m ²
Weight	312 lb.	141 kg
Weight/horsepower	2.50 lb./h.p.	1,13 kg/hp
Fuel consumption (cr.)	0.55 lb./h.p./hr.	250 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.28 h.p./cu.in.	17,3 hp/lit
Output/piston area	1.48 h.p./sq.in.	0.23 hp/cm ²
Piston speed (max.)	1,684 ft./min.	8,5 m/sec
B.m.e.p. (max.)	117 lb./sq.in.	8,2 kg/cm ²
Rating (take-off)	125 h.p./1,925 r.p.m.	
Rating (normal)	125 h.p./1,925 r.p.m./sea level	
Rating (cruising)	93 h.p./1,725 r.p.m./sea level	

B-5: Same as B-54. Tapered propeller shaft. A.T.C. 51.



Kinner K-5

Kinner K-5Model **K-52.**

Type 5 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 3.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Tapered propeller shaft.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-R5A or Holley 419 updraft carburetor.

Ignition 2 Bendix-Scintilla SB5LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 100 lb./sq.in. (7,0 kg/cm²). Dry sump.

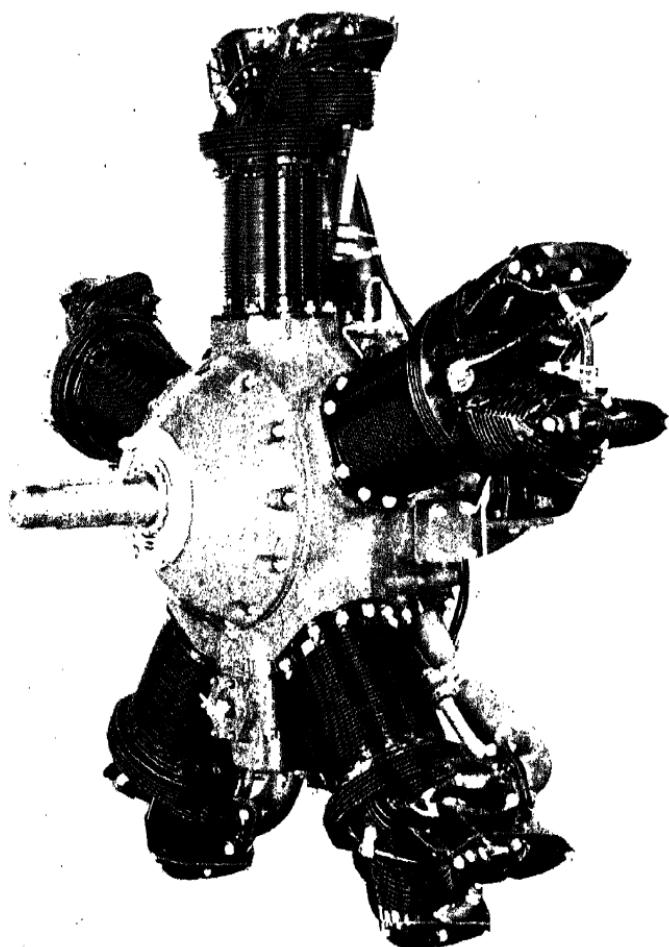
Starter Eclipse E-80 direct cranking electric starter or Eclipse 390 hand starter.

Bore	4.25 in.	108 mm
Stroke	5.25 in.	133 mm
Displacement	372 cu.in.	6,1 lit
Compression ratio	5.1:1	5,1:1
Diameter	45.4 in.	1 153 mm
Length	33.0 in.	838 mm
Frontal area	11.2 sq.ft.	1,04 m ²
Weight	304 lb.	138 kg
Weight/horsepower	3.04 lb./h.p.	1,38 kg/hp
Fuel consumption (cr.)	0.55 lb./h.p./hr.	250 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.27 h.p./cu.in.	16,3 hp/lit
Output/piston area	1.40 h.p./sq.in.	0,21 hp/cm ²
Piston speed (max.)	1,584 ft./min.	8,0 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	8,3 kg/cm ²

Rating (take-off) 100 h.p./1,810 r.p.m.

Rating (normal) 100 h.p./1,810 r.p.m./sea level

Rating (cruising) 75 h.p./1,610 r.p.m./sea level



Kinner R-5

Kinner R-5Model **R-56.**

Type 5 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 153.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 1 roller bearing and 1 plain bearing. Splined propeller shaft.

Supercharger None.

Carburation 1 Holley 419 updraft carburetor.

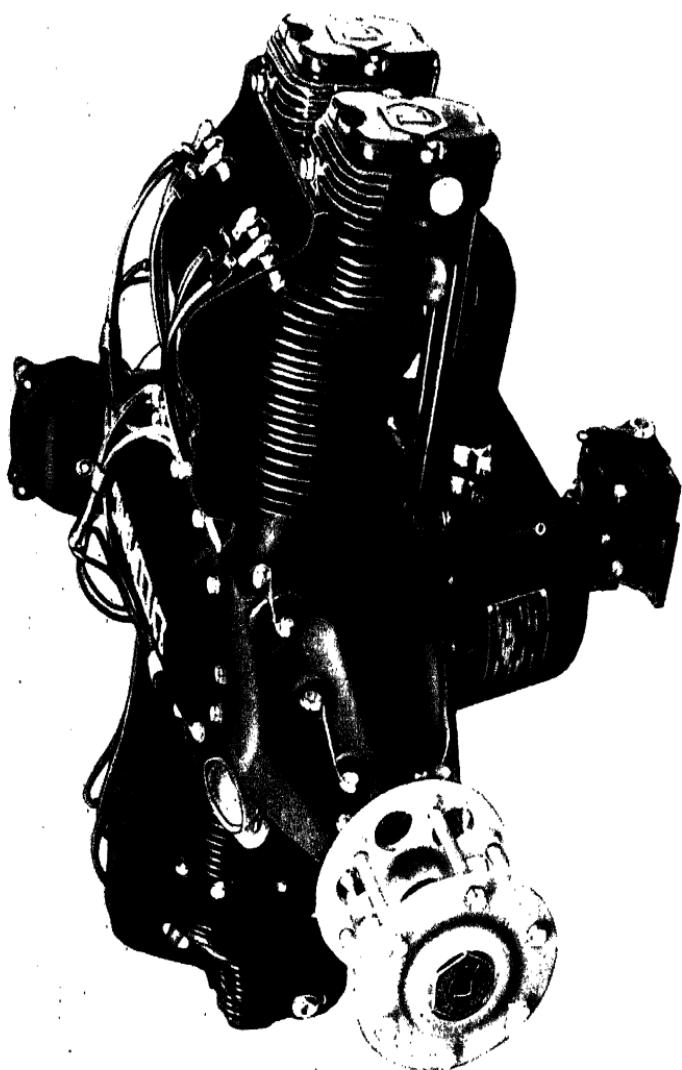
Ignition 2 Bendix-Scintilla SB5LN-3 magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm²). Dry sump.

Starter Eclipse 390 hand starter.

Bore	5.00 in.	127 mm
Stroke	5.50 in.	140 mm
Displacement	540 cu.in.	8,8 lit
Compression ratio	5.5:1	5,5:1
Diameter	45.6 in.	1 158 mm
Length	33.6 in.	853 mm
Frontal area	11.3 sq.ft.	1,05 m ²
Weight	362 lb.	159 kg
Weight/horsepower	2.26 lb./h.p.	0,91 kg/hp
Fuel consumption (cr.)	0.55 lb./h.p./hr.	250 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.30 h.p./cu.in.	18,2 hp/lit
Output/piston area	1.65 h.p./sq.in.	0,26 hp/cm ²
Piston speed (max.)	1 675 ft./min.	8,6 m/sec
B.m.e.p. (max.)	127 lb./sq.in.	8,9 kg/cm ²
Rating (take-off)	160 h.p./1,850 r.p.m.	
Rating (normal)	160 h.p./1,850 r.p.m./sea level	
Rating (cruising)	113 h.p./1,650 r.p.m./sea level	

R-52: Similar to R-56. Tapered propeller shaft. A.T.C. 153.**R-55:** Same as R-56. A.T.C. 153.



Wyoming GO-145

Lycoming O-145

Model	GO-145-C4.	
Type	4 cylinders, horizontally opposed, air cooled, geared drive, not supercharged, 4-cycle. A.T.C. 210	
Construction	2-piece semi-steel crankcase divided vertically. 2 cylinders integral with each half of the crankcase. Detachable aluminum alloy cylinder heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 3 plain bearings. Spur reduction gear, ratio 0.63:1.	
Supercharger	None.	
Carburation	1 Bendix-Stromberg NA-S2 or Marvel-Schebler MA-2 updraft carburetor.	
Ignition	2 Bendix-Scintilla SFLN-8 magnetos. 2 14-mm short reach spark plugs per cylinder.	
Lubrication	Pressure feed, 65-85 lb./sq.in. (4,0 - 6,0 kg/cm ²). Wet sump.	
Starter	Delco-Remy electric starter.	
Bore	3.625 in.	92 mm
Stroke	3.50 in.	89 mm
Displacement	144 cu.in.	2,4 lit
Compression ratio	6.5:1	6.5:1
Width	29.6 in.	752 mm
Height	23.0 in.	584 mm
Length	30.7 in.	780 mm
Frontal area	2.4 sq.ft.	0,22 m ²
Weight	233 lb.	106 kg
Weight/horsepower	3.11 lb./h.p.	1,41 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.010 lb./h.p./hr.	4,5 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	60-80 S.U. secs.	10,3 - 15,6 cs
Output/displacement	0.52 h.p./cu.in.	31,2 hp/lit
Output/piston area	1.81 h.p./sq.in.	0,28 hp/cm ²
Piston speed (max.)	1,867 ft./min.	9,5 m/sec
B.m.e.p. (max.)	129 lb./sq.in.	9,1 kg/cm ²
Rating (take-off)	75 h.p./3,200 r.p.m.	
Rating (normal)	75 h.p./3,200 r.p.m./sea level	
Rating (cruising)	56 h.p./2,900 r.p.m./sea level	

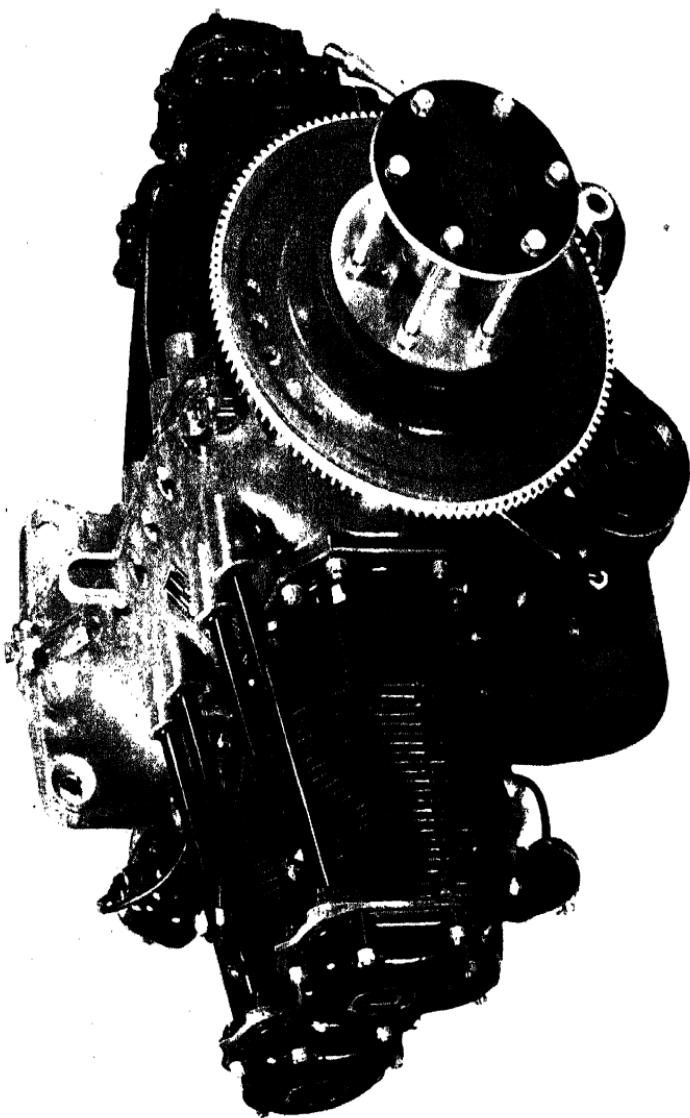
O-145-A2, O-145-A3, O-145-A4: 55 h.p./2,300 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 199.

O-145-B2, O-145-B3, O-145-B4: 65 h.p./2,550 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 210.

O-145-C2, O-145-C3, O-145-C4: 75 h.p./3,100 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 210.

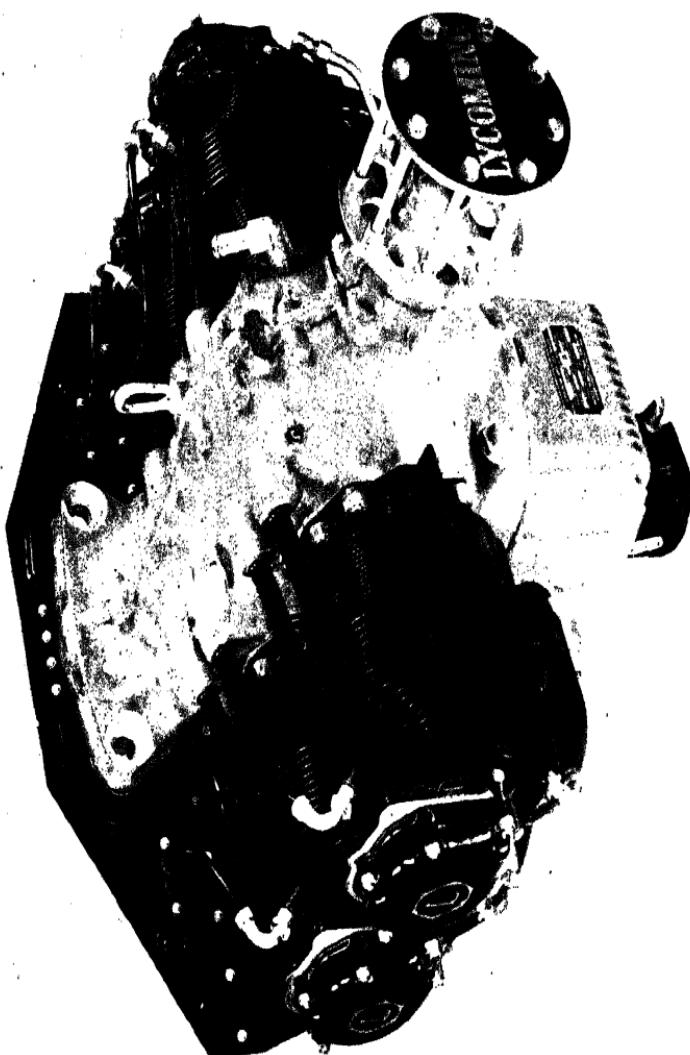
GO-145-C2, GO-145-C3: Same as GO-145-C4. Reduction gear ratio 0.63:1. A.T.C. 210.

Note: O-145-A4, O-145-B4, O-145-C4 and GO-145-C4 engines are equipped with automotive type electric starters.



Lycoming O-235

Model	O-235-C.	
Type	4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 223.	
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 4 plain bearings. Equipped for tractor propeller.	
Supercharger	None.	
Carburation	1 Marvel-Schebler MA-3A updraft carburetor.	
Ignition	2 Bendix-Scintilla SF4LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder.	
Lubrication	Pressure feed, 65-85 lb./sq.in. (4,6 - 6,0 kg/cm ²). Wet sump.	
Starter	Automotive type electric starter and starter ring.	
Bore	4.375 in.	111 mm
Stroke	3.875 in.	98 mm
Displacement	234 cu.in.	3,8 lit
Compression ratio	6.25:1	6,25:1
Width	32.3 in.	821 mm
Height	25.2 in.	640 mm
Length	30.1 in.	764 mm
Frontal area	3.2 sq.ft.	0,30 m ²
Weight	244 lb.	111 kg
Weight/horsepower	2.34 lb./h.p.	1,06 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80-100 S.U. secs.	15,6 - 20,5 cs
Output/displacement	0.44 h.p./cu.in.	27,3 hp/lit
Output/piston area	1.73 h.p./sq.in.	0,27 hp/cm ²
Piston speed (max.)	1.679 ft./min.	8,5 m/sec
B.m.e.p. (max.)	134 lb./sq.in.	9,4 kg/cm ²
Rating (take-off)	104 h.p./2,600 r.p.m.	
Rating (normal)	104 h.p./2,600 r.p.m./sea level	
Rating (cruising)	75 h.p./2,360 r.p.m./sea level	
O-235-A:	100 h.p./2,600 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. Automotive type electric starter. A.T.C. 223.	
O-235-AP:	Similar to O-235-A. Equipped for tractor or pusher propeller. Automotive type electric starter. A.T.C. 223.	
O-235-B:	Same as O-235-A. Automotive type electric starter. A.T.C. 223.	
O-235-BP:	Same as O-235-A. Equipped for tractor or pusher propeller. Eclipse E-80 electric starter. A.T.C. 223.	



Lycoming

Lycoming O-290

Model O-290-C.

Type 4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 229.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 4 plain bearings. Equipped for tractor propeller.

Supercharger None.

Carburation 1 Marvel-Schebler MA-3SPA updraft carburetor.

Ignition 2 Bendix-Scintilla SF4LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 65-85 lb./sq.in. (4,6-6,0 kg/cm²). Wet sump.

Starter Eclipse E-80 direct cranking electric starter.

Bore	4.875 in.	124 mm
Stroke	3.875 in.	98 mm
Displacement	289 cu.in.	4,7 lit
Compression ratio	6.5:1	6,5:1
Width	32.3 in.	820 mm
Height	26.6 in.	676 mm
Length	30.1 in.	764 mm
Frontal area	3.7 sq.ft.	0,34 m ²
Weight	242 lb.	110 kg
Weight/horsepower	1.86 lb./h.p.	0,84 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80-100 S.U. secs.	15,6-20,5 cs
Output/displacement	0.45 h.p./cu.in.	27,7 hp/lit
Output/piston area	1.75 h.p./sq.in.	0,27 hp/cm ²
Piston speed (max.)	1,808 ft./min.	9,1 m/sec
B.m.e.p. (max.)	127 lb./sq.in.	8,9 kg/cm ²

Rating (take-off) 130 h.p./2,800 r.p.m.

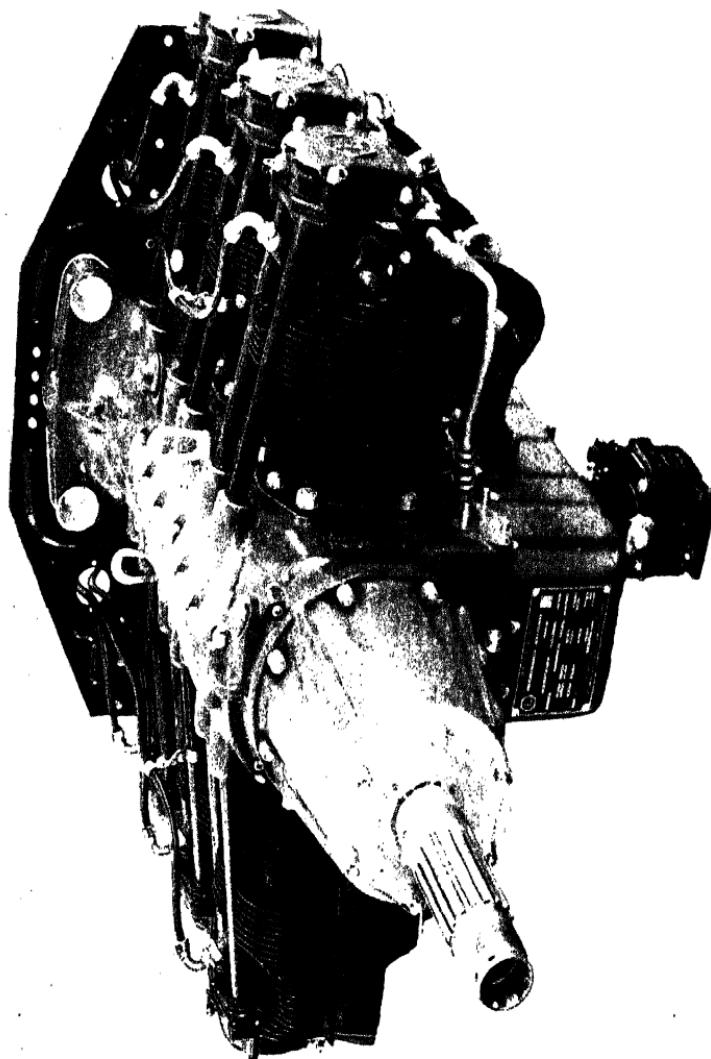
Rating (normal) 125 h.p./2,600 r.p.m./sea level

Rating (cruising) 94 h.p./2,380 r.p.m./sea level

O-290-A: Same as O-290-C. Automotive type electric starter. A.T.C. 229.

O-290-AP: Similar to O-290-C. Equipped for tractor or pusher propeller. Automotive type electric starter. A.T.C. 229.

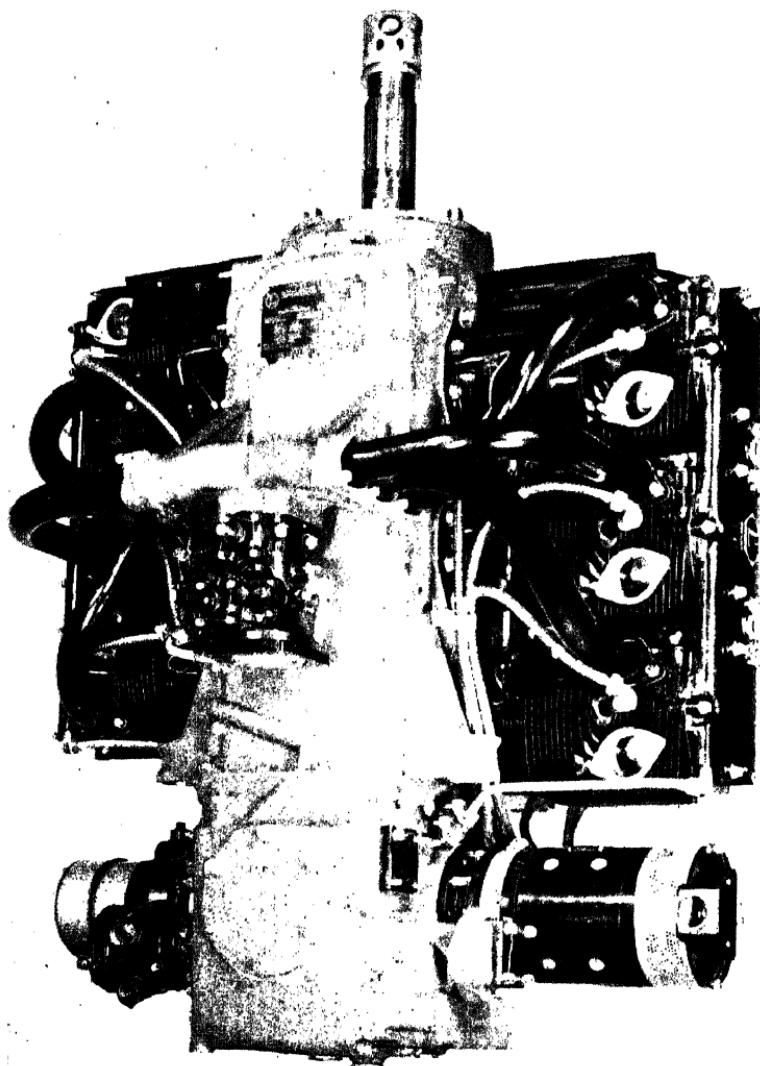
O-290-CP: Similar to O-290-C. Equipped for tractor or pusher propeller. Eclipse E-80 electric starter. A.T.C. 229.



ycoming GO-435

Lycoming O-435

Model	GO-435-B.	
Type	6 cylinders, horizontally opposed, air cooled, geared drive, not supercharged, 4-cycle. A.T.C. pending.	
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 4 plain bearings. Planetary reduction gear, ratio 0.64:1.	
Supercharger	None.	
Carburation	1 Marvel-Schebler MA-4-5 updraft carburetor.	
Ignition	2 Bendix-Scintilla SF6LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 65-85 lb./sq.in. (4,6 - 6,0 kg/cm ²). Wet sump.	
Starter	Eclipse E-80 direct cranking electric starter.	
Bore	4.875 in.	124 mm
Stroke	3.875 in.	98 mm
Displacement	434 cu.in.	7,5 lit
Compression ratio	7.5:1	7,5:1
Width	32.3 in.	820 mm
Height	29.6 in.	752 mm
Length	47.7 in.	1 212 mm
Frontal area	3.9 sq.ft.	0,36 m ²
Weight	401 lb.	182 kg
Weight/horsepower	1.82 lb./h.p.	0,83 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	80-100 S.U. secs.	15,6 - 20,5 cs
Output/displacement	0.51 h.p./cu.in.	29,3 hp/lit
Output/piston area	1.97 h.p./sq.in.	30,3 hp/cm ²
Piston speed (max.)	1,938 ft./min.	9,8 m/sec
B.m.e.p. (max.)	135 lb./sq.in.	9,5 kg/cm ²
Rating (take-off)	220 h.p./3,000 r.p.m.	
Rating (normal)	220 h.p./3,000 r.p.m./sea level	
Rating (cruising)	165 h.p./2,725 r.p.m./sea level	
O-435A:	185 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. Delco-Remy electric starter. A.T.C. 228.	
O-435-B:	235 h.p./3,000 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 100-octane gasoline. A.T.C. 228.	
O-435-C:	185 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 228.	
GO-435:	210 h.p./3,000 r.p.m./take-off and normal rating at sea level. Reduction gear ratio 0.64:1. Not supercharged. 73-octane gasoline. A.T.C. 228.	

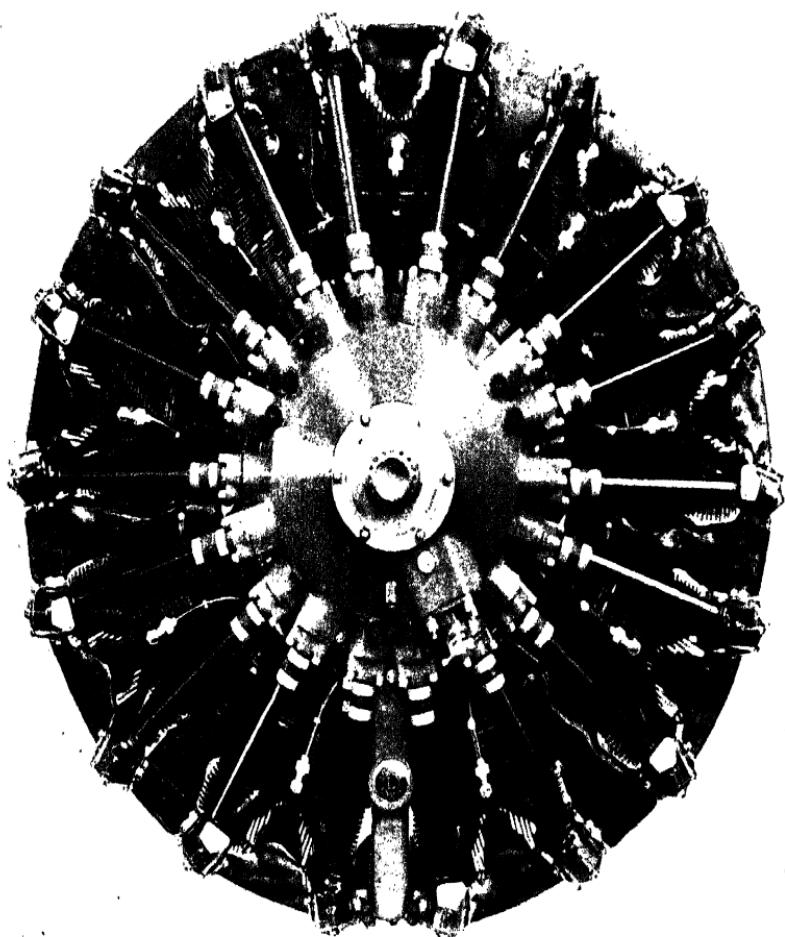


Lycoming O-435-D (Helicopter)

Lycoming O-435-D (Helicopter)

Model	O-435-D.
Type	6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. pending.
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods and hydraulic tappets. 6-throw 1-piece crankshaft supported in 4 plain bearings and 1 main thrust roller bearing. Cooling fan on top of engine driven at crankshaft speed.
Supercharger	None.
Carburation	1 Marvel-Schebler MA-4-5 updraft carburetor.
Ignition	2 Bendix-Scintilla SF6LN-8 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 75 lb./sq.in. (5,3 kg/cm ²). Dry sump.
Starter	Eclipse 777 direct cranking electric starter.
Bore	4.875 in. 124 mm
Stroke	3.875 in. 98 mm
Displacement	434 cu.in. 7,5 lit
Compression ratio	7.5:1 7,5:1
Width (across valve covers)	33.2 in. 843 mm
Width (across carburetor)	29.9 in. 760 mm
Height (vertical)	43.5 in. 1 105 mm
Weight (including cooling)	433 lb. 196 kg
Weight/horsepower	2.04 lb./h.p. 0,92 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr. 215 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr. 9 g/hp/hr
Gasoline grade	100/130 grade 100/130 grade
Oil grade (viscosity)	80-100 S.U. secs. 15,6 - 20,5 cs
Output/displacement	0.49 h.p./cu.in. 28,2 hp/lit
Output/piston area	1.89 h.p./sq.in. 0,29 hp/cm ²
Piston speed (max.)	1,937 ft./min. 9,8 m/sec
B.m.e.p. (max.)	129 lb./sq.in. 9,1 kg/cm ²
Rating (take-off)	212 h.p./3,000 r.p.m.
Rating (normal)	212 h.p./3,000 r.p.m./sea level
Rating (cruising)	150 h.p./2,700 r.p.m./sea level

Note: This engine is designed for vertical installation in helicopters.



Lycoming R-680

Lycoming R-680Model **R-680-E3A.**

Type 9 cylinders, 1-row radial, air cooled, direct drive, ground boosted, 4-cycle. A.T.C. 202.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger Gear-driven ground blower, ratio 1.0:1.

Carburation 1 Bendix-Stromberg NA-R7A carburetor.

Ignition 1 Bendix-Scintilla SC-A2 dual magneto. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 50-75 lb./sq.in. (3,5 - 5,3 kg/cm²). Dry sump.

Starter Eclipse 424 hand inertia starter.

Bore	4.625 in.	117 mm
Stroke	4.50 in.	114 mm
Displacement	680 cu.in.	11,1 lit
Compressions ratio	7.0:1	7,0:1
Diameter	43.5 in.	1 105 mm
Length	37.5 in.	953 mm
Frontal area	10.3 sq.ft.	0,96 m ²
Weight	515 lb.	234 kg
Weight/horsepower	1.71 lb./h.p.	0,78 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.44 h.p./cu.in.	27,0 hp/lit
Output/piston area	1.98 h.p./sq.in.	0,31 hp/cm ²
Piston speed (max.)	1,725 ft./min.	8,7 m/sec
B.m.e.p. (max.)	152 lb./sq.in.	10,7 kg/cm ²

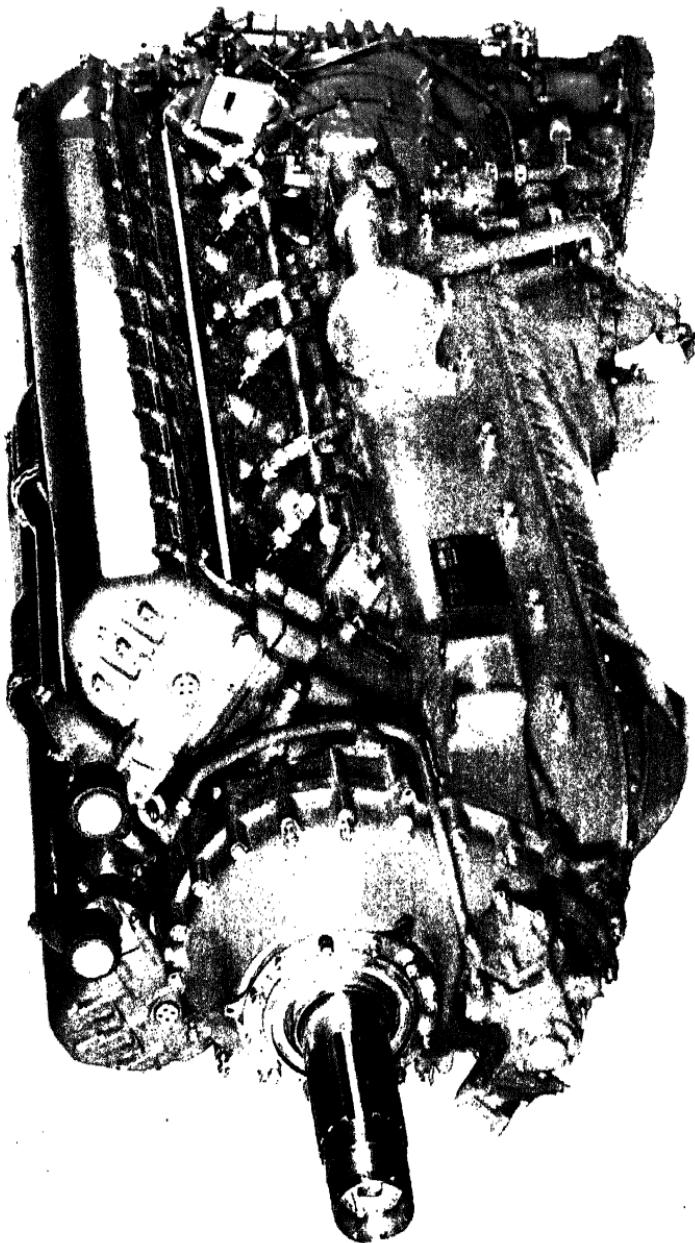
Rating (take-off) 300 h.p./2,300 r.p.m.

Rating (normal) 285 h.p./2,200 r.p.m./sea level

Rating (cruising) 214 h.p./1,910 r.p.m./sea level

R-680-B4D: 225 h.p./2,100 r.p.m./take-off and normal rating at sea level. Direct drive. Ground blower, ratio 1.0:1. 73-octane gasoline. A.T.C. 108.

R-680-E3B: Same as R-680-E3A. A.T.C. 202.



Packard

65

Packard V-1650-1Model **V-1650-1.**

Type 12-cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.477:1.

Supercharger Gear-driven 2-speed 1-stage supercharger, ratios 8.15:1 and 9.49:1. Automatic boost control.

Carburation 1 Bendix-Stromberg PD-16A1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.

Ignition 2 B.T.H. C5SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-80 lb./sq.in. (4,9 - 5,6 kg/cm²). Dry sump.

Starter Eclipse 792 or 840 direct cranking electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	42.6 in.	1 082 mm
Length	79.7 in.	2 025 mm
Frontal area	5.8 sq.ft.	0,54 m ²
Weight	1,512 lb.	685 kg
Weight/horsepower	1.16 lb./h.p.	0,53 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.79 h.p./cu.in.	48,1 hp/lit
Output/piston area	4.73 h.p./sq.in.	0,73 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	209 lb./sq.in.	14,7 kg/cm ²

Rating (take-off) 1,300 h.p./3,000 r.p.m./54.3 in. (1 379 mm) Hg. boost

Rating (military, low) 1,240 h.p./3,000 r.p.m./11,500 ft. (3 500 m)

Rating (military, high) 1,120 h.p./3,000 r.p.m./18,500 ft. (5 600 m)

Rating (normal, low) 1,080 h.p./2,650 r.p.m./9,500 ft. (2 900 m)

Rating (normal, high) 1,010 h.p./2,650 r.p.m./16,000 ft. (4 900 m)

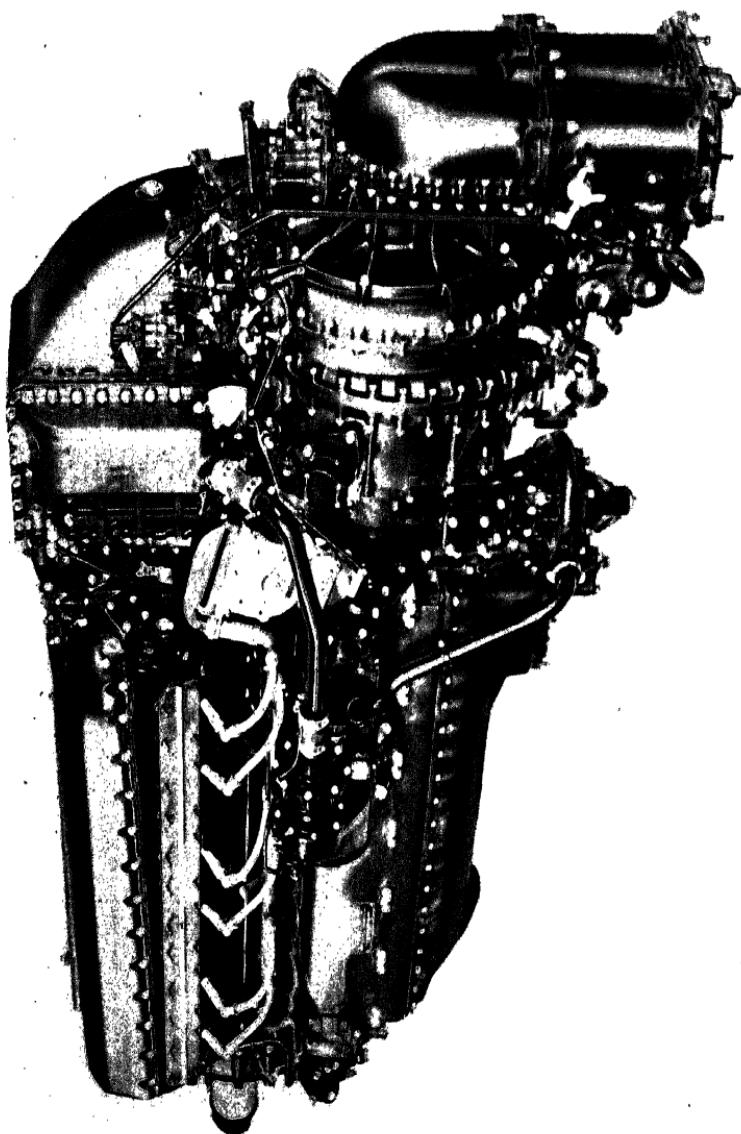
This engine is similar to the British Rolls-Royce Merlin XX. It is manufactured by Packard for use in United States aircraft.

The following 1-stage engines are manufactured by Packard for use in British aircraft:

Merlin 28: Similar to V-1650-1. Reduction gear ratio 0.42:1.

Merlin 29: Same as Merlin 28. Reduction gear ratio 0.48:1.

Merlin 31, 33, 38: Same as Merlin 28. Reduction gear ratio 0.42:1.



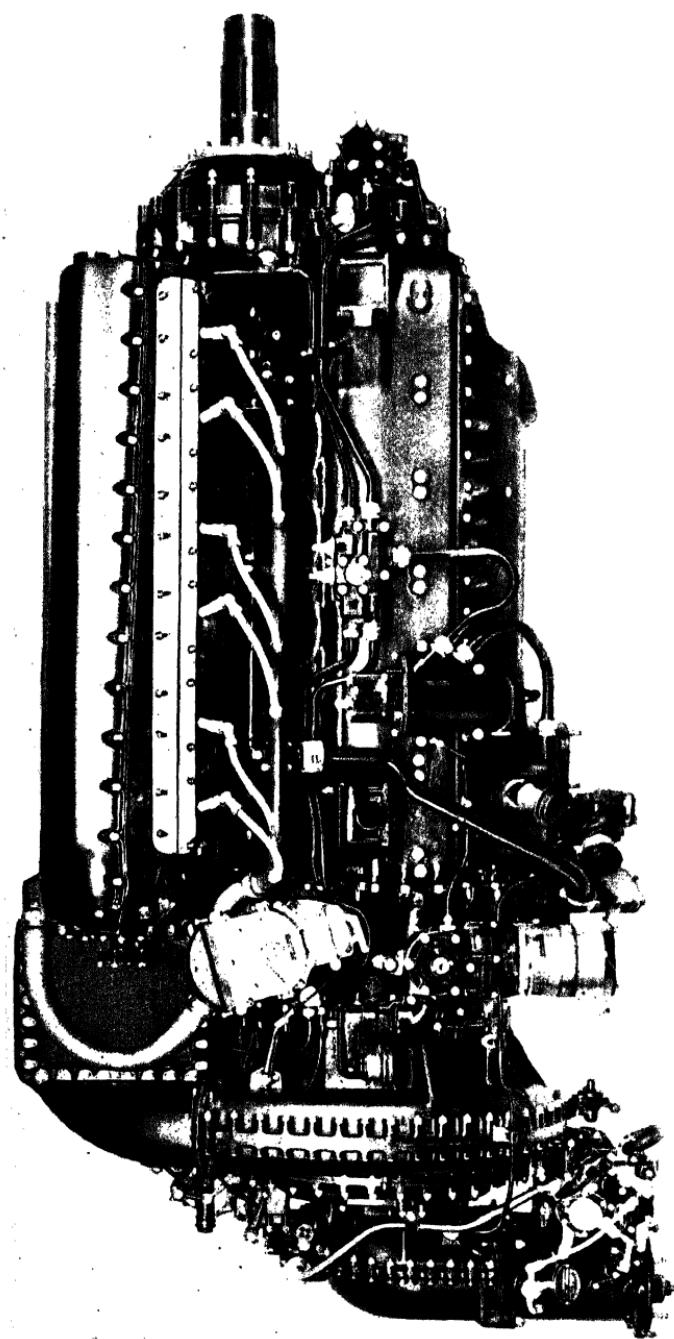
650-3

Packard

Packard V-1650-3

Model	V-1650-3.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.479:1.	
Supercharger.....	Gear-driven 2-speed 2-stage supercharger, ratios 6.391:1 and 8.095:1. Automatic boost control. Water-cooled interstage passages and aftercooler.	
Carburation	1 Bendix-Stromberg PD-18A1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.	
Ignition.....	2 B.T.H. C6SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-80 lb./sq.in. (4.9 - 5.6 kg/cm ²). Dry sump.	
Starter	Eclipse 840 direct cranking electric starter.	
Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio.....	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	41.6 in.	1 056 mm
Length	87.1 in.	2 212 mm
Frontal area.....	5.9 sq.ft.	0,55 m ²
Weight	1,690 lb.	766 kg
Weight/horsepower	1.13 lb./h.p.	0,51 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.90 h.p./cu.in.	55,1 hp/lit
Output/piston area.....	5.42 h.p./sq.in.	0,84 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	238 lb./sq.in.	16,7 kg/cm ²
Rating (take-off)	1,380 h.p./3,000 r.p.m./61.0 in. (1 549 mm) Hg. boost	
Rating (military, low)	1,490 h.p./3,000 r.p.m./13,750 ft. (4 200 m)	
Rating (military, high)	1,210 h.p./3,000 r.p.m./25,800 ft. (7 900 m)	
Rating (normal, low)	1,100 h.p./2,700 r.p.m./17,400 ft. (5 300 m)	
Rating (normal, high)	950 h.p./2,700 r.p.m./29,500 ft. (9 000 m)	

This engine is similar to the British Rolls-Royce Merlin 61. It is manufactured by Packard for use in United States aircraft.

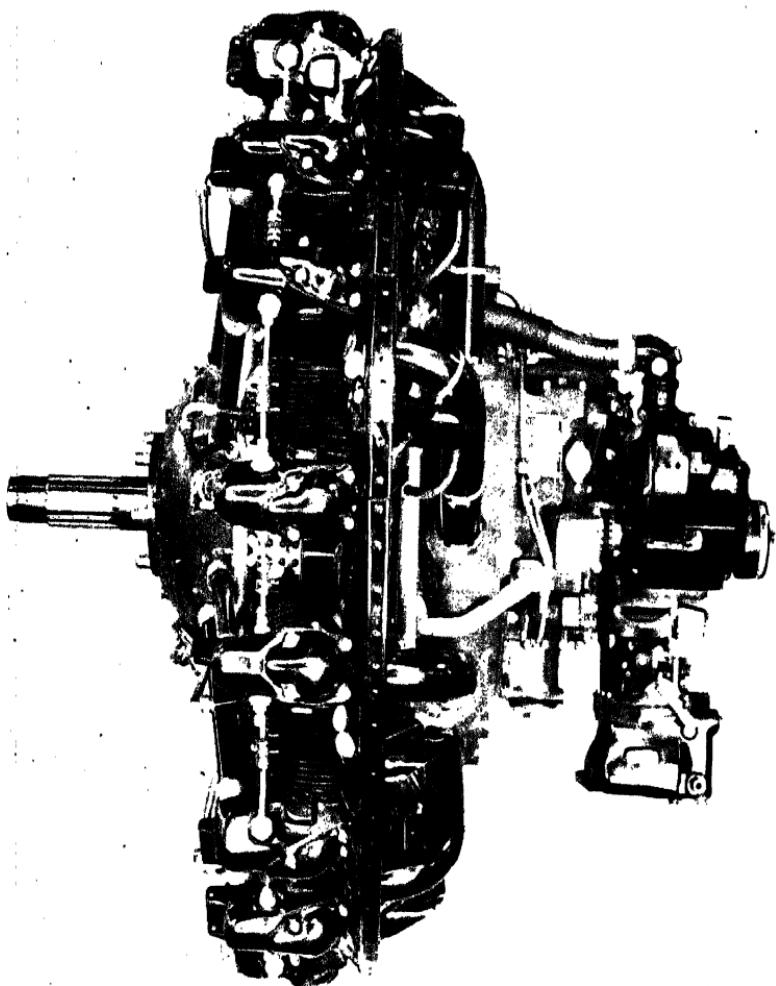


Packard 650

Packard V-1650-7

Model	V-1650-7.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.479:1.	
Supercharger.....	Gear-driven 2-speed 2-stage supercharger, ratios 5.80:1 and 7.35:1. Automatic boost control. Water-cooled interstage passages and aftercooler.	
Carburation.....	1 Bendix-Stromberg PD-18A1 or PD-18C1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.	
Ignition.....	2 B.T.H. C6SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-80 lb./sq.in. (4.9 - 5.6 kg/cm ²). Dry sump.	
Starter	Eclipse 840 direct cranking electric starter.	
Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio.....	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	41.6 in.	1 056 mm
Length	87.1 in.	2 212 mm
Frontal area.....	5.9 sq.ft.	0,55 m ²
Weight	1,690 lb.	766 kg
Weight/horsepower	1.06 lb./h.p.	0,48 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.005 lb./h.p./hr.	2 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.96 h.p./cu.in.	58,9 hp/lit
Output/piston area.....	5.92 h.p./sq.in.	0,92 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	253 lb./sq.in.	17,8 kg/cm ²
Rating (take-off)	1,490 h.p./3,000 r.p.m./61.0 in. (1 549 mm) Hg. boost	
Rating (military, low)	1,590 h.p./3,000 r.p.m./8,500 ft. (2 600 m)	
Rating (military, high)	1,370 h.p./3,000 r.p.m./21,400 ft. (6 500 m)	
Rating (normal, low)	1,180 h.p./2,700 r.p.m./11,300 ft. (3 400 m)	
Rating (normal, high)	1,065 h.p./2,700 r.p.m./23,400 ft. (7 100 m)	

This engine is similar to the British Rolls-Royce Merlin 63. It is manufactured by Packard for use in United States aircraft.

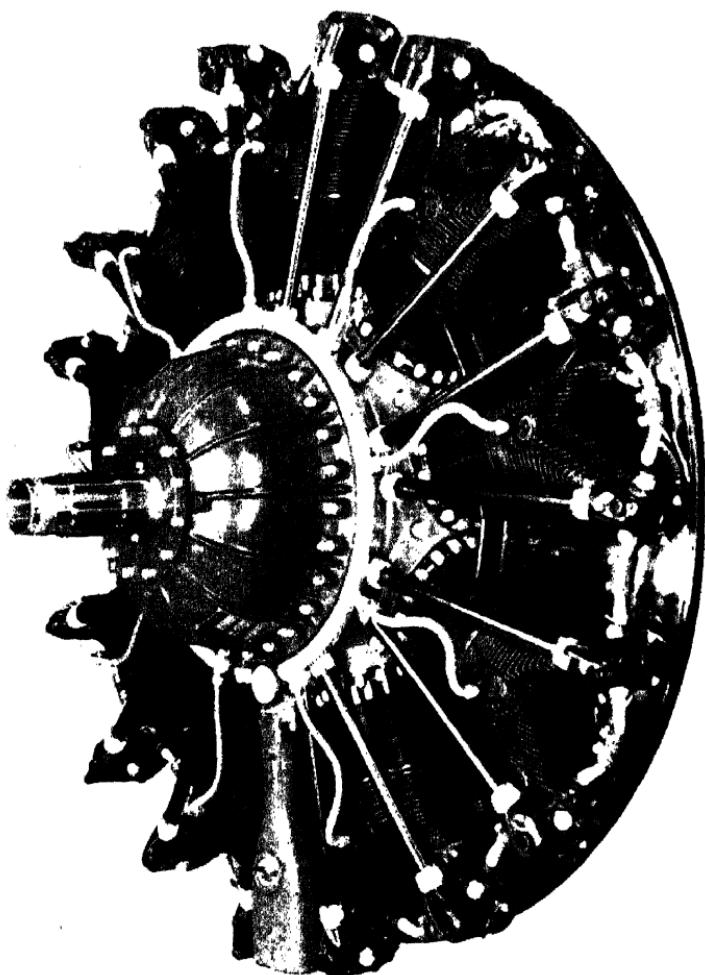


Pratt & Whitney Wasp Junior R-985

Pratt & Whitney Wasp Junior R-985

Model	R-985 SB3.	
Type	9 cylinders, 1-row radial, air cooled, direct drive, supercharged, 4-cycle. A.T.C. 123.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Provision for Hydro-matic propeller.	
Supercharger	Gear-driven 1-speed supercharger, ratio 10.0:1.	
Carburation	1 Bendix-Stromberg NA-R9B or NA-R9C updraft carburetor with automatic mixture control.	
Ignition	2 Bendix-Scintilla SB9RN-4 or American Bosch SB9RU-3 magneto. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse E-160 direct cranking electric starter can be used.	
Bore	5.1875 in.	132 mm
Stroke	5.1875 in.	132 mm
Displacement	985 cu.in.	16,1 lit
Compression ratio	6.0:1	6,0:1
Diameter	46.1 in.	1 172 mm
Length	43.1 in.	1 094 mm
Frontal area	11.6 sq.ft.	1,08 m ²
Weight	682 lb.	309 kg
Weight/horsepower	1.51 lb./h.p.	0,68 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.46 h.p./cu.in.	27,9 hp/lit
Output/piston area	2.32 h.p./sq.in.	0,36 hp/cm ²
Piston speed (max.)	1,988 ft./min.	10,1 m/sec
B.m.e.p. (max.)	157 lb./sq.in.	11,0 kg/cm ²
Rating (take-off)	450 h.p./2,300 r.p.m./36.5 in. (927 mm) Hg. boost	
Rating (military)	450 h.p./2,300 r.p.m./3,500 ft. (1 100 m)	
Rating (normal)	400 h.p./2,200 r.p.m./5,000 ft. (1 500 m)	
Rating (max. cruising)	300 h.p./2,000 r.p.m./8,000 ft. (2 400 m)	

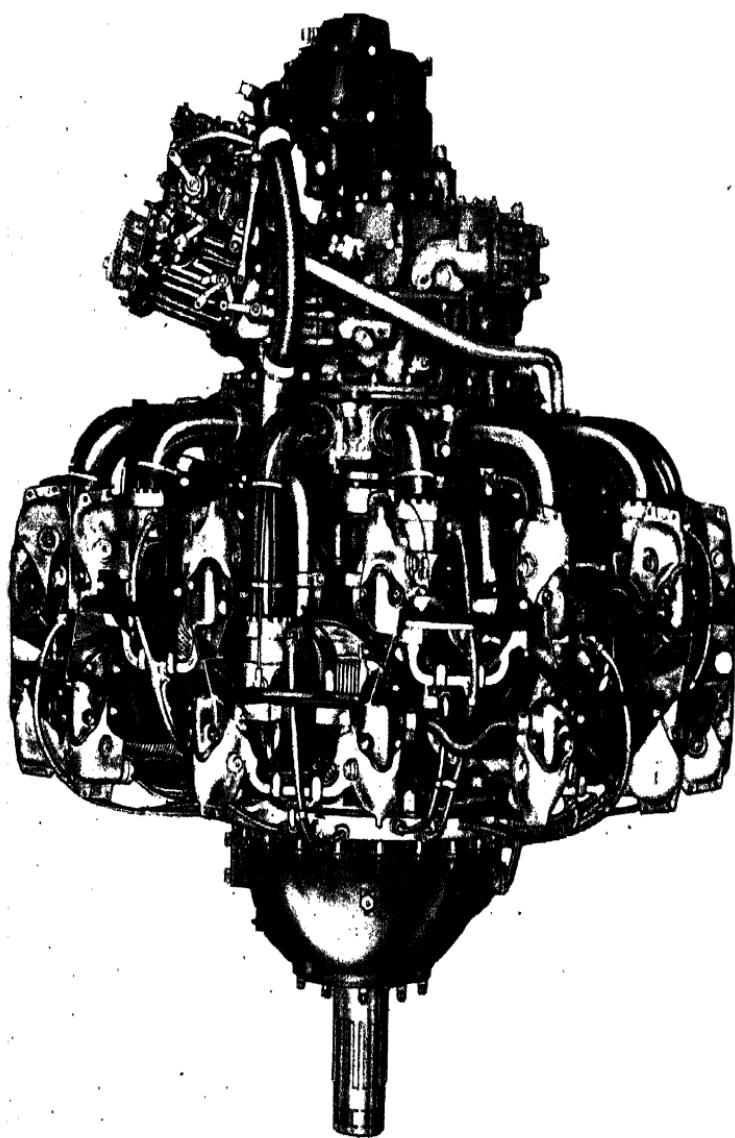
R-985 T1B3: Similar to R-985 SB3. 450 h.p./take-off and normal rating at sea level. Direct drive. 1-speed supercharger, ratio 10.0:1. 91/96 grade gasoline. Provision for Hydro-matic propeller. A.T.C. 123. Note: This engine can be modified for operation with its crank-shaft in a vertical plane for use in helicopters.



Pratt & Whitney Wasp R-1340

Pratt & Whitney Wasp R-1340

Model	R-1340 S3H1-G.	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. 142.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary bevel reduction gear, ratio 0.67:1. Provision for Hydromatic propeller.	
Supercharger	Gear-driven 1-speed supercharger, ratio 12.0:1.	
Carburation	1 Bendix-Stromberg NA-Y9E1 updraft carburetor with automatic mixture control.	
Ignition	2 Bendix-Scintilla SB9RN-4 or American Bosch SB9RU-3 magneto. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-90 lb./sq.in. (4.9 - 6.3 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse E-160 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.	
Bore	5.75 in.	146 mm
Stroke	5.75 in.	146 mm
Displacement	1,344 cu.in.	22,0 lit
Compression ratio	6.0:1	6,0:1
Diameter	51.8 in.	1 315 mm
Length	47.8 in.	1 214 mm
Frontal area	14.6 sq.ft.	1,36 m ²
Weight	938 lb.	425 kg
Weight/horsepower	1.56 lb./h.p.	0,71 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.45 h.p./cu.in.	27,2 hp/lit
Output/piston area	2.56 h.p./sq.in.	0,40 hp/cm ²
Piston speed (max.)	2,156 ft./min.	10,9 m/sec
B.m.e.p. (max.)	157 lb./sq.in.	11,0 kg/cm ²
Rating (take-off)	600 h.p./2,250 r.p.m./36.5 in. (927 mm) Hg. boost	
Rating (military)	600 h.p./2,250 r.p.m./3,000 ft. (900 m)	
Rating (normal)	550 h.p./2,200 r.p.m./5,000 ft. (1 500 m)	
Rating (max. cruising)	400 h.p./2,000 r.p.m./9,000 ft. (2 700 m)	
R-1340 S1H1-G:	600 h.p./2,250 r.p.m./take-off; 600 h.p./2,250 r.p.m./6,200 ft. (1 900 m) military rating; 550 h.p./2,200 r.p.m./8,000 ft. (2 400 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 12.0:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 129.	
R-1340 S3H1:	600 h.p./2,250 r.p.m./take-off; 600 h.p./2,250 r.p.m./3,000 ft. (900 m) military rating; 550 h.p./2,200 r.p.m./5,000 ft. (1 500 m) normal rating. Direct drive. 1-speed supercharger, ratio 10.0:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 143.	

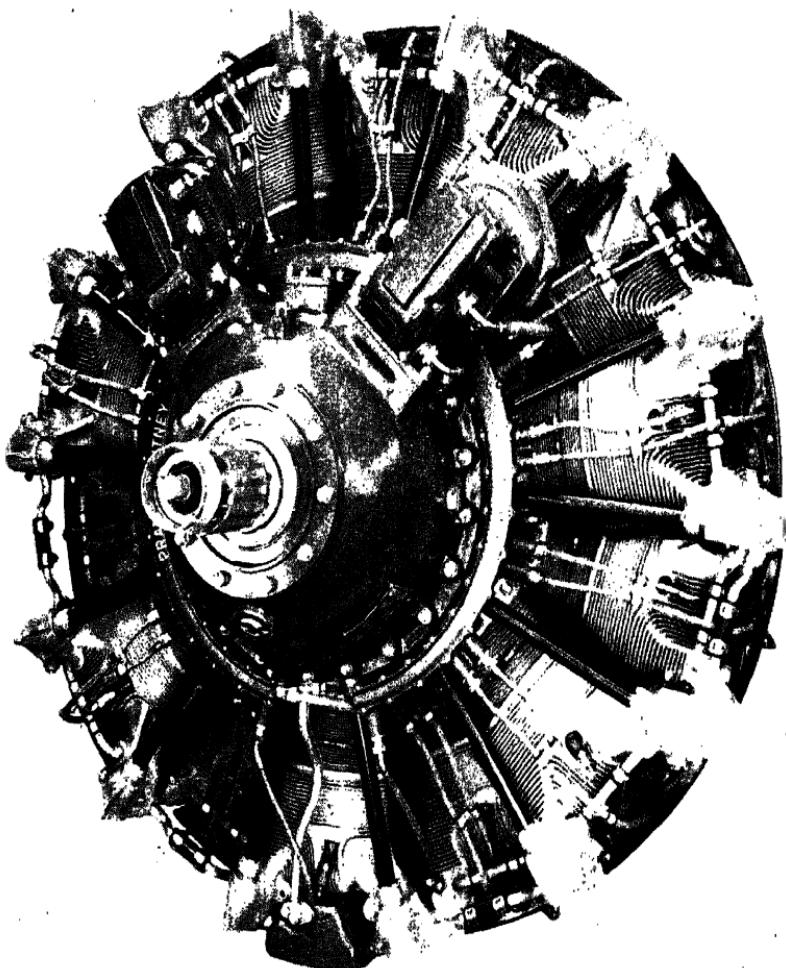


Pratt & Whitney Twin Wasp 830 age

Pratt & Whitney Twin Wasp R-1830 (1-stage)

Model	R-1830 S3C4-G (C series).	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. 186.	
Construction	3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary bevel reduction gear, ratio 0.56:1. Provision for Hydromatic propeller.	
Supercharger	Gear-driven 2-speed supercharger, ratios 7.15:1 and 8.47:1.	
Carburation	1 Bendix-Stromberg PD-12F5 2-barrel injection type downdraft carburetor with automatic mixture control.	
Ignition	2 Bendix-Scintilla SF14LN-3 or American Bosch SF14LU-7 magnetos, 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 75-100 lb./sq.in. (5,3 - 7,0 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.	
Bore	5.50 in.	140 mm
Stroke	5.50 in.	140 mm
Displacement	1,830 cu.in.	30,0 lit
Compression ratio	6.7:1	6,7:1
Diameter	48.2 in.	1 224 mm
Length	63.4 in.	1 611 mm
Frontal area	12.6 sq.ft.	1,17 m ²
Weight	1,492 lb.	678 kg
Weight/horsepower	1.24 lb./h.p.	0,56 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.66 h.p./cu.in.	40,0 hp/lit
Output/piston area	3.60 h.p./sq.in.	0,56 hp/cm ²
Piston speed (max.)	2,475 ft./min.	12,6 m/sec
B.m.e.p. (max.)	192 lb./sq.in.	13,5 kg/cm ²
Rating (take-off)	1,200 h.p./2,700 r.p.m./48.0 in. (1 219 mm) Hg. boost	
Rating (military, low)	1,200 h.p./2,700 r.p.m./4,900 ft. (1 500 m)	
Rating (military, high)	1,050 h.p./2,700 r.p.m./13,100 ft. (4 000 m)	
Rating (normal, low)	1,100 h.p./2,550 r.p.m./6,100 ft. (1 900 m)	
Rating (normal, high)	1,000 h.p./2,550 r.p.m./12,500 ft. (3 800 m)	
Rating (cruising, low)	700 h.p./2,250 r.p.m./12,500 ft. (3 800 m)	
Rating (cruising, high)	675 h.p./2,250 r.p.m./17,000 ft. (5 200 m)	

Additional models of Pratt & Whitney Twin Wasp R-1830 (1-stage) engines will be found on page 143.



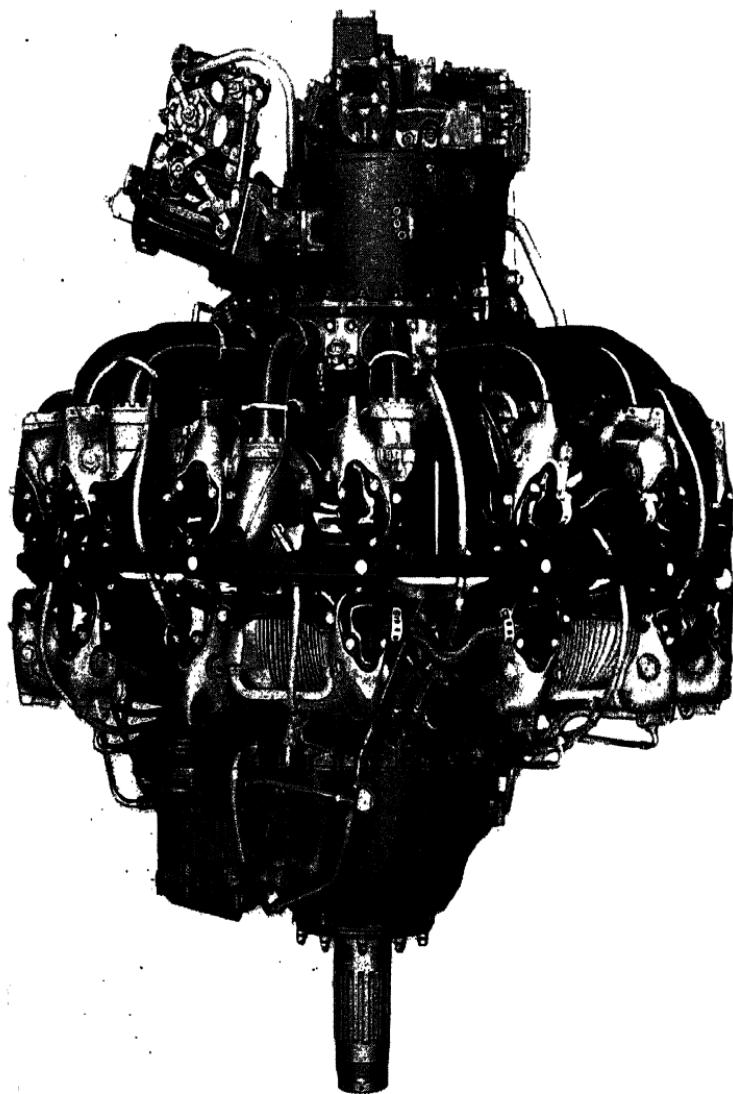
Pratt & Whitney Twin Wasp R-1830 (2-stage)

Pratt & Whitney Twin Wasp R-1830 (2-stage)

Model	R-1830 SSC7-G (C series).
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.
Construction	3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary bevel reduction gear, ratio 0.316:1 or 0.67:1. Provision for Hydromatic propeller.
Supercharger	Gear-driven 2-speed 2-stage supercharger consisting of a main stage (1-speed) ratio 8.08:1, and an auxiliary stage (2-speed) ratios 6.43:1 and 8.48:1. Intercooler. Automatic pressure regulator.
Carburation	1 Bendix-Stromberg PD-12E4 2-barrel injection type down-draft carburetor with automatic mixture control.
Ignition	2 Bendix-Scintilla SF14LN-3 or American Bosch SF14LU-7 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 75-100 lb./sq.in. (5,3 - 7,0 kg/cm ²). Dry sump.
Starter	Optional. Eclipse 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.
Bore	5.50 in. 140 mm
Stroke	5.50 in. 140 mm
Displacement	1,830 cu.in. 30,0 lit
Compression ratio	6.7:1 6,7:1
Diameter	48.2 in. 1 224 mm
Length	67.5 in. 1 715 mm
Frontal area	12.6 sq.ft. 1,17 m ²
Weight	1,572 lb. 684 kg
Weight/horsepower	1.31 lb./h.p. 0,59 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr. 215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr. 7 g/hp/hr
Gasoline grade	100/130 grade 100/130 grade
Oil grade (viscosity)	100-120 S.U. secs. 20,5 - 25,1 cs
Output/displacement	0.66 h.p./cu.in. 40,0 hp/lit
Output/piston area	3.60 h.p./sq.in. 0,56 hp/cm ²
Piston speed (max.)	2,475 ft./min. 12,6 m/sec
B.m.e.p. (max.)	192 lb./sq.in. 13,5 kg/cm ²
Rating (take-off)	1,200 h.p./2,700 r.p.m./48.0 in. (1 219 mm) Hg. boost
Rating (military, main)	1,200 h.p./2,700 r.p.m./2,500 ft. (800 m)
Rating (military, low)	1,150 h.p./2,700 r.p.m./9,500 ft. (2 900 m)
Rating (military, high)	1,100 h.p./2,700 r.p.m./17,500 ft. (5 300 m)
Rating (normal, main)	1,100 h.p./2,550 r.p.m./3,500 ft. (1 100 m)
Rating (normal, low)	1,050 h.p./2,550 r.p.m./11,000 ft. (3 400 m)
Rating (normal, high)	1,000 h.p./2,550 r.p.m./19,000 ft. (5 800 m)

R-1930 SSC5-G: Same as R-1830 SSC7-G.

Note: The above engines were built for military purposes only and they were never actually given a commercial designation.

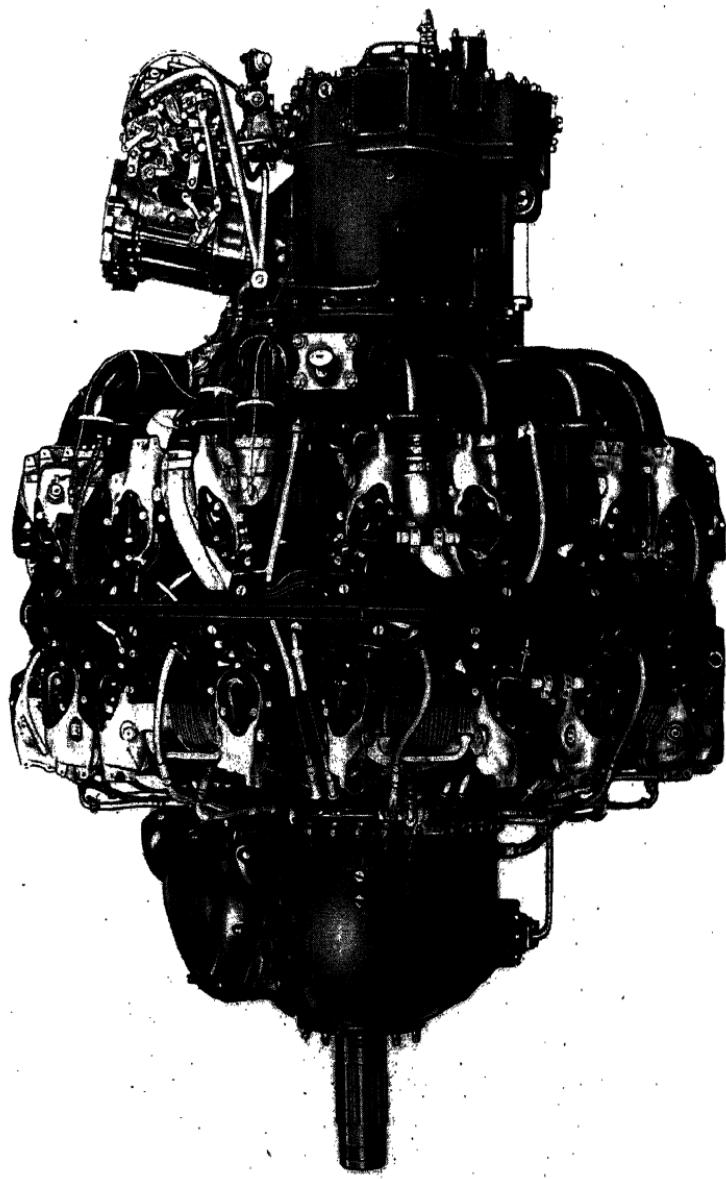


Pratt & Whitney Twin Wasp 2000

Pratt & Whitney Twin Wasp R-2000

Model	R-2000 2SD1-G (D series).	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.	
Construction	3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary bevel reduction gear, ratio 0.50:1. Provision for Hydromatic propeller.	
Supercharger	Gear-driven 2-speed supercharger, ratios 7.15:1 and 9.52:1.	
Carburation	1 Bendix-Stromberg PD-12F7 2-barrel injection type downdraft carburetor with automatic mixture control.	
Ignition	2 Bendix-Scintilla SF14RN-8 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 85-100 lb./sq.in. (6,0 - 7,0 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.	
Bore	5.75 in.	146 mm
Stroke	5.50 in.	140 mm
Displacement	2,000 cu.in.	32,7 lit
Compression ratio	6.5:1	6.5:1
Diameter	49.5 in.	1 257 mm
Length	60.7 in.	1 543 mm
Frontal area	13.4 sq.ft.	1.24 m ²
Weight	1,590 lb.	721 kg
Weight/horsepower	1.10 lb./h.p.	0.50 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20.5 - 25.1 cs
Output/displacement	0.72 h.p./cu.in.	44.3 hp/lit
Output/piston area	3.99 h.p./sq.in.	0.62 hp/cm ²
Piston speed (max.)	2,475 ft./min.	12.6 m/sec
B.m.e.p. (max.)	211 lb./sq.in.	15.4 kg/cm ²
Rating (take-off)	1,450 h.p./2,700 r.p.m./48.5 in. (1 232 mm) Hg. boost	
Rating (military, low)	1,450 h.p./2,700 r.p.m./1,000 ft. (300 m)	
Rating (military, high)	1,100 h.p./2,700 r.p.m./16,000 ft. (4 900 m)	
Rating (normal, low)	1,100 h.p./2,550 r.p.m./7,500 ft. (2 200 m)	
Rating (normal, high)	1,000 h.p./2,550 r.p.m./17,000 ft. (5 200 m)	
Rating (cruising, low)	735 h.p./2,230 r.p.m./14,700 ft. (4 500 m)	
Rating (cruising, high)	700 h.p./2,150 r.p.m./21,500 ft. (6 600 m)	

An additional model of the Pratt & Whitney Twin Wasp R-2000 engine will be found on page 143.



Pratt & Whitney Double Wasp R-2800 (17-stage)

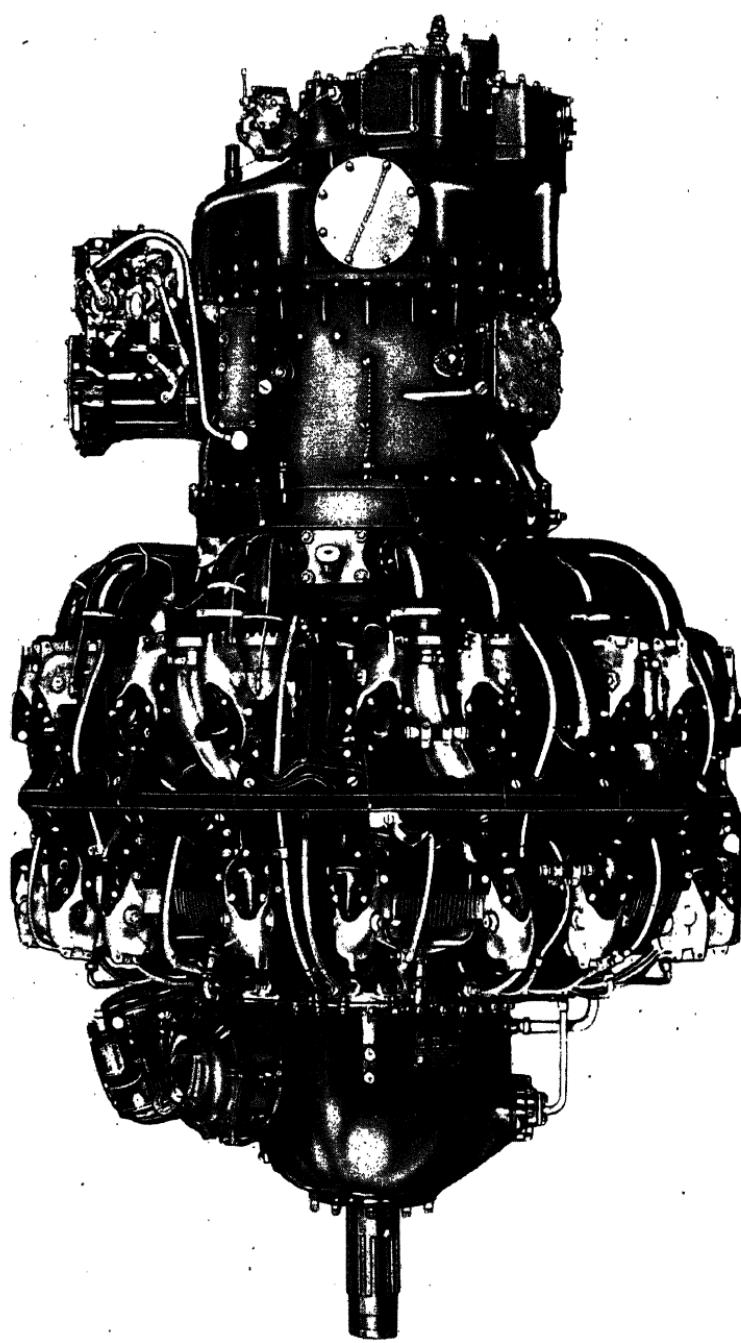
Pratt & Whitney Double Wasp R-2800 (1-stage)

Model **R-2800 2SB-G (B series)**.
 Type 18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. 231.
 Construction 3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 plain bearings. Planetary spur reduction gear, ratio 0.50:1 or 0.56:1. Provision for Hydromatic propeller.
 Supercharger Gear-driven 2-speed 1-stage supercharger, ratios 7.60:1 and 9.89:1. Automatic boost control.
 Carburation 1 Bendix-Stromberg PT-13G1 3-barrel injection type downdraft carburetor with automatic mixture control.
 Ignition 1 Bendix-Scintilla DF18RN or American Bosch DF18RU-1 dual magneto and 2 18-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.
 Lubrication Pressure feed, 75-100 lb./sq.in. (5,3 - 7,0 kg/cm²). Dry sump.
 Starter Optional. Eclipse 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.

Bore	5.75 in.	146 mm
Stroke	6.00 in.	152 mm
Displacement	2,804 cu.in.	45,9 lit
Compression ratio	6.65:1	6,65:1
Diameter	52.5 in.	1 334 mm
Length	75.7 in.	1 923 mm
Frontal area	15.0 sq.ft.	1,40 m ²
Weight	2,290 lb.	1 039 kg
Weight/horsepower	1.14 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.71 h.p./cu.in.	43,6 hp/lit
Output/piston area	4.28 h.p./sq.in.	0,66 hp/cm ²
Piston speed (max.)	2,700 ft./min.	13,7 m/sec
B.m.e.p. (max.)	208 lb./sq.in.	14,6 kg/cm ²
Rating (take-off)	2,000 h.p./2,700 r.p.m./52.0 in. (1 321 mm) Hg. boost	
Rating (military, low)	2,000 h.p./2,700 r.p.m./1,500 ft. (450 m)	
Rating (military, high)	1,600 h.p./2,700 r.p.m./13,500 ft. (4 100 m)	
Rating (normal, low)	1,600 h.p./2,400 r.p.m./5,700 ft. (1 700 m)	
Rating (normal, high)	1,450 h.p./2,400 r.p.m./13,000 ft. (4 000 m)	
Rating (cruising, low)	1,070 h.p./2,100 r.p.m./10,000 ft. (3 000 m)	
Rating (cruising, high)	975 h.p./2,100 r.p.m./17,500 ft. (5 300 m)	

R-2800 TSB1-G (B series): 2,000 h.p./2,700 r.p.m./take-off; 2,000 h.p./2,700 r.p.m./1,500 ft. (450 m) military rating; 1,625 h.p./2,550 r.p.m./6,500 ft. (2 000 m) normal rating. Reduction gear ratio 0.50:1 or 0.56:1. 1-speed 1-stage supercharger, ratio 7.60:1. 2 General Electric S18LG-P1A magnetos. 100/130 grade gasoline. Provision for Hydromatic propeller. Note: This 1-speed engine (illustrated on the opposite page) can be equipped with a turbo-supercharger.

Additional models of Pratt & Whitney Double Wasp R-2800 (1-stage) engines will be found on page 143.

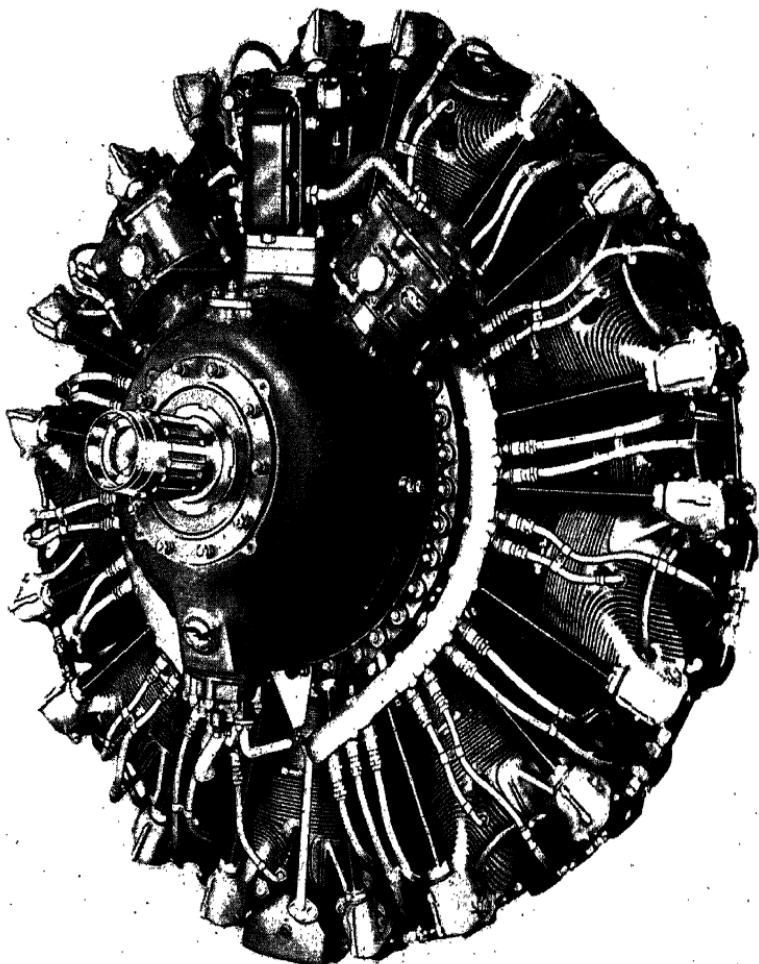


Pratt & Whitney R-2800 Double Wasp engine

Pratt & Whitney Double Wasp R-2800 (2-stage)

Model	R-2800 SSB2-G (B series).	
Type	18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.	
Construction	3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 plain bearings. Planetary spur reduction gear, ratio 0.50:1 or 0.56:1. Provision for Hydromatic propeller.	
Supercharger	Gear-driven 2-speed 2-stage supercharger consisting of a main stage (1-speed) ratio 7.80:1, and an auxiliary stage (2-speed) ratios 6.46:1 and 7.93:1. Intercooler. Automatic pressure regulator.	
Carburation	1 Bendix-Stromberg PT-13D6 or PT-13G6 3-barrel injection type downdraft carburetor with automatic mixture control.	
Ignition	1 Bendix-Scintilla DF18RN or American Bosch DF18RU-1 dual magneto and 2 18-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.	
Lubrication	Pressure feed, 75-100 lb./sq.in. (5.3-7.0 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.	
Bore	5.75 in.	146 mm
Stroke	6.00 in.	152 mm
Displacement	2,804 cu.in.	45.9 lit
Compression ratio	6.65:1	6.65:1
Diameter	52.5 in.	1 334 mm
Length	88.5 in.	2 247 mm
Frontal area	15.0 sq.ft.	1,40 m ²
Weight	2,480 lb.	1 125 kg
Weight/horsepower	1.24 lb./h.p.	0.56 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20.5-25.1 cs
Output/displacement	0.71 h.p./cu.in.	43.6 hp/lit
Output/piston area	4.28 h.p./sq.in.	0.66 hp/cm ²
Piston speed (max.)	2,700 ft./min.	13.7 m/sec
B.m.e.p. (max.)	208 lb./sq.in.	14.6 kg/cm ²
Rating (take-off)	2,000 h.p./2,700 r.p.m./54.0 in. (1 372 mm) Hg. boost	
Rating (military, main)	2,000 h.p./2,700 r.p.m./1,000 ft. (300 m)	
Rating (military, low)	1,800 h.p./2,700 r.p.m./15,500 ft. (4 700 m)	
Rating (military, high)	1,650 h.p./2,700 r.p.m./22,500 ft. (6 800 m)	
Rating (normal, main)	1,675 h.p./2,250 r.p.m./5,500 ft. (1 700 m)	
Rating (normal, low)	1,625 h.p./2,550 r.p.m./17,000 ft. (5 200 m)	
Rating (normal, high)	1,550 h.p./2,550 r.p.m./21,500 ft. (6 600 m)	
Rating (cruising, main)	1,120 h.p./2,230 r.p.m./11,200 ft. (3 400 m)	
Rating (cruising, low)	1,100 h.p./2,230 r.p.m./20,000 ft. (6 100 m)	
Rating (cruising, high)	1,040 h.p./2,230 r.p.m./25,500 ft. (7 800 m)	

Note: C series engines similar to the B series engine above are now in production. They have forged aluminum alloy cylinder heads and improved supercharging. They are rated at 2,100 h.p. at take-off. (All other data restricted, January, 1945).



Pratt & Whitney Double Wasp R-2800 (2-stage)

Additional Models of Pratt & Whitney R-1830 (1-stage) Engines
(Continued from page 133)

R-1830 S1C3-G: 1,200 h.p./2,700 r.p.m./take-off; 1,200 h.p./2,700 r.p.m./4,900 ft. (1 500 m) military rating; 1,050 h.p./2,550 r.p.m./7,500 ft. (2 300 m) normal rating. Reduction gear ratio 0.56:1. 1-speed supercharger, ratio 7.15:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 186. Note: This 1-speed engine can be equipped with a turbo-supercharger.

R-1830 S4C4-G: 1,200 h.p./2,700 r.p.m./take-off; 1,200 h.p./2,700 r.p.m./3,700 ft. (1 100 m) and 900 h.p./2,700 r.p.m./17,400 ft. (5 300 m) military rating; 1,050 h.p./2,550 r.p.m./7,500 ft. (2 300 m) and 900 h.p./2,550 r.p.m./15,400 ft. (4 700 m) normal rating. Reduction gear ratio 0.67:1. 2-speed supercharger, ratios 7.15:1 and 8.47:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 186.

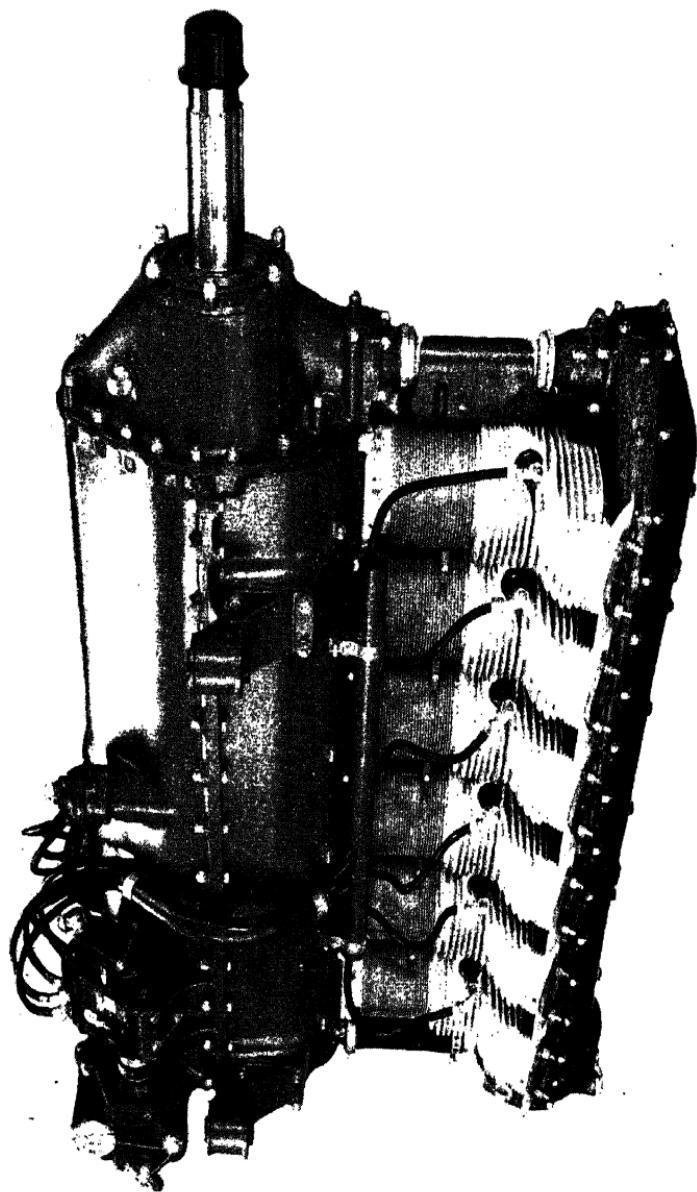
Additional Model of Pratt & Whitney R-2000 Engines
(Continued from page 137)

R-2000 2SD-G: 1,350 h.p./2,700 r.p.m./take-off; 1,350 h.p./2,700 r.p.m./2,000 ft. (600 m) military rating; 1,100 h.p./2,550 r.p.m./7,000 ft. (2 100 m) and 1,000 h.p./2,550 r.p.m./14,000 ft. (4 300 m) normal rating. Reduction gear ratio 0.50:1. 2-speed supercharger, ratios 7.15:1 and 8.47:1. 100/130 grade gasoline. Provision for Hydromatic propeller. A.T.C. 230.

Additional Models of Pratt & Whitney R-2800 (1-stage) Engines
(Continued from page 139)

R-2800 S1A4-G: 1,850 h.p./2,600 r.p.m./take-off; 1,850 h.p./2,600 r.p.m./2,700 ft. (800 m) and 1,500 h.p./2,600 r.p.m./14,000 ft. (4 300 m) military rating; 1,500 h.p./2,400 r.p.m./7,500 ft. (2 300 m) and 1,450 h.p./2,400 r.p.m./13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.40:1, 0.50:1 or 0.56:1. 2-speed supercharger, ratios 7.60:1 and 9.45:1. 100/130 grade gasoline. Provision for Hydromatic propeller.

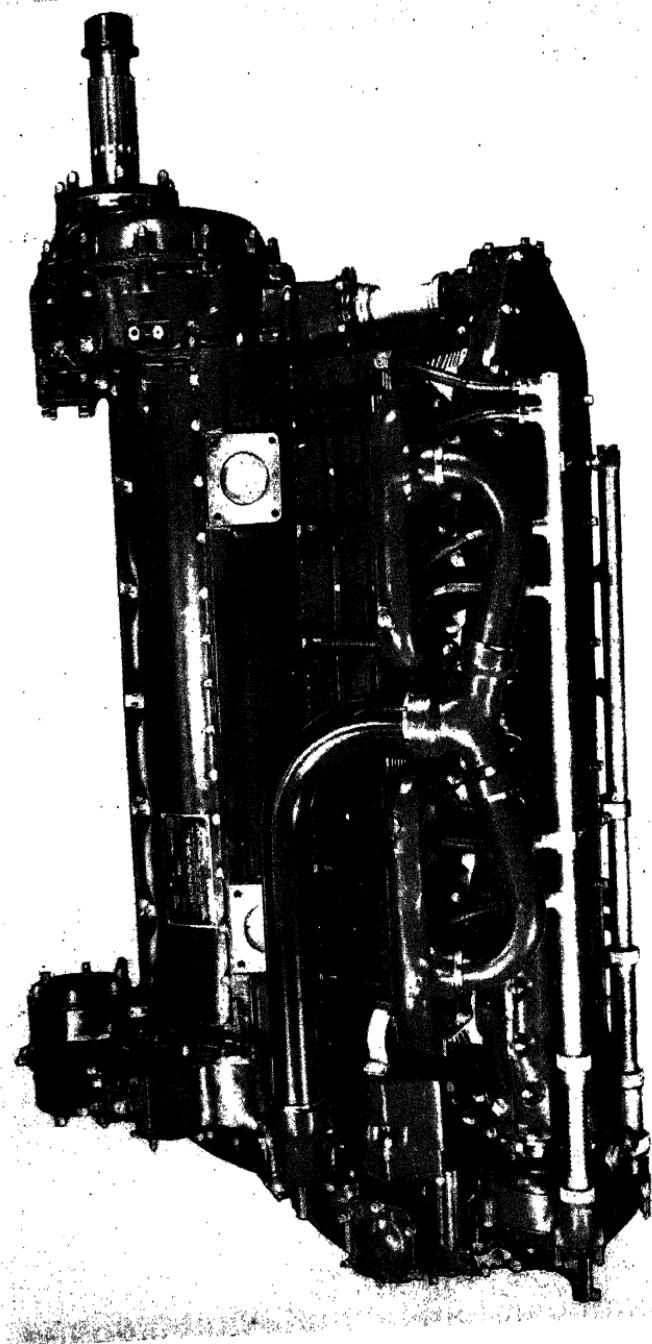
R-2800 S1A6-G: 1,850 h.p./2,600 r.p.m./take-off; 1,850 h.p./2,600 r.p.m./2,700 ft. (800 m) military rating; 1,500 h.p./2,400 r.p.m./7,500 ft. (2 300 m) normal rating. Reduction gear ratio 0.40:1, 0.50:1 or 0.56:1. 1-speed supercharger, ratio 7.15:1. 100/130 grade gasoline. Provision for Hydromatic propeller.



Ranger .440

Ranger 6-440

Model	6-440C-5 (L-440-3).
Type	6 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 216.
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by overhead camshaft. 6-throw 1-piece crank-shaft equipped with vibration damper and supported in 7 plain bearings.
Supercharger	None.
Carburation	1 Bendix-Stromberg NA-R4B or Marvel-Schebler MA-4-5 up-draft carburetor.
Ignition	1 Bendix-Scintilla SB6RN-8 magneto and 1 Bendix-Scintilla SB6RN-10 magneto, 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 50-70 lb./sq.in. (3,5 - 4,9 kg/cm ²). Dry sump.
Starter	Eclipse E-80 direct cranking electric starter.
Bore	4.125 in. 105 mm
Stroke	5.50 in. 140 mm
Displacement	441 cu.in. 7,2 lit
Compression ratio.....	7.5:1 7.5:1
Width	21.9 in. 556 mm
Height	33.5 in. 850 mm
Length	53.2 in. 1 351 mm
Frontal area	3.0 sq.ft. 0,28 m ²
Weight	376 lb. 170 kg
Weight/horsepower	1.88 lb./h.p. 0,85 kg/hp
Fuel consumption (cr.)	0.43 lb./h.p./hr. 195 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr. 9 g/hp/hr
Gasoline grade	87 octane 87 octane
Oil grade (viscosity)	100-120 S.U. secs. 20,5 - 25,1 cs
Output/displacement	0.45 h.p./cu.in. 27,8 hp/lit
Output/piston area	2.49 h.p./sq.in. 0,39 hp/cm ²
Piston speed (max.)	2,246 ft./min. 11,2 m/sec
B.m.e.p. (max.)	146 lb./sq.in. 10,3 kg/cm ²
Rating (take-off)	200 h.p./2,450 r.p.m.
Rating (normal)	200 h.p./2,450 r.p.m./sea level
Rating (cruising)	150 h.p./2,230 r.p.m./seal level
6-440C-2 (L-440-1):	175 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 216.
6-440C-3:	180 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 216.
6-440C-4:	190 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 80-octane gasoline. A.T.C. 216.



Ranger SGV-770C

Ranger SGV-770C

Model SGV-770C-1B (C series).

Type 12 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.

Construction 2-piece aluminum alloy crankcase. Al-Fin cylinder (steel barrels with integral aluminum alloy fins) and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece crankshaft with pendulum type vibration dampers supported in 7 plain bearings. Herringbone reduction gear, ratio 0.67:1. Provision for Hydromatic or constant speed propeller.

Supercharger Gear-driven 1-speed supercharger, ratio 9.5:1.

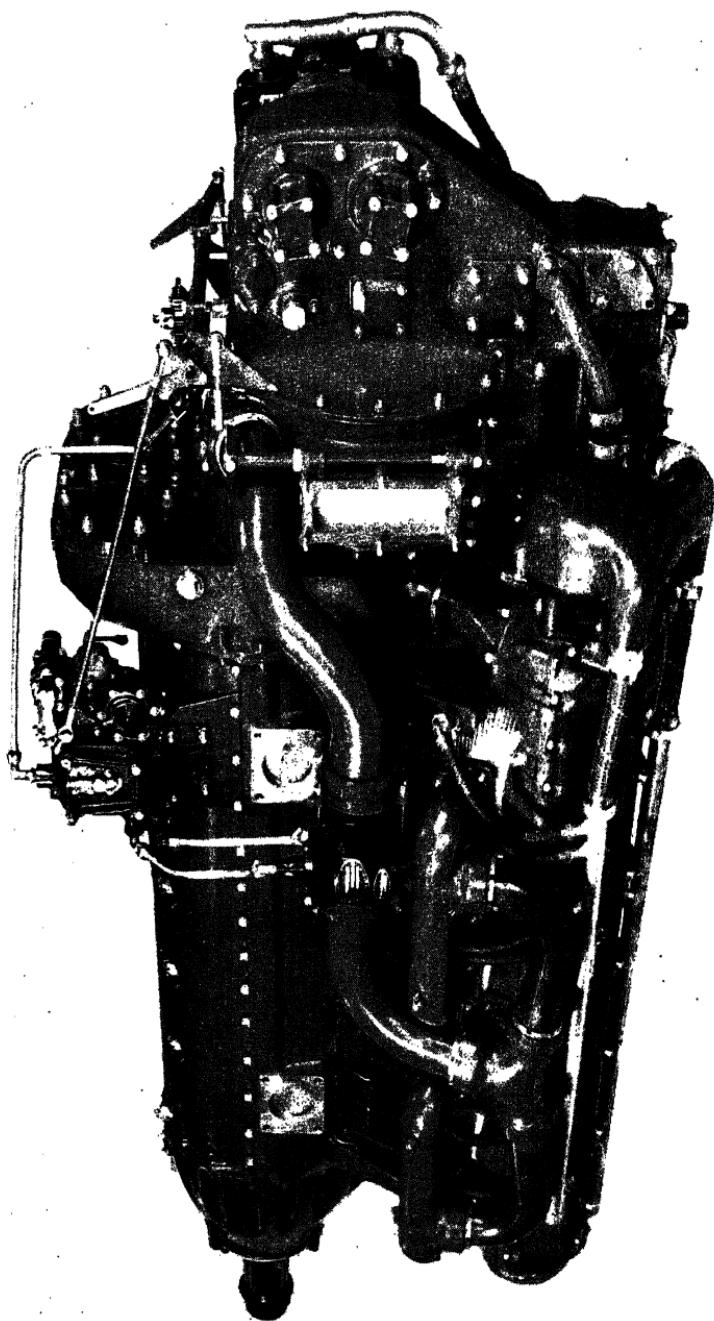
Carburation 1 Bendix-Stromberg QD-9B1 spinner injection type carburetor.

Ignition 1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60-80 lb./sq.in. (4,2 - 5,6 kg/cm²). Dry sump.

Starter Optional. Eclipse E-160 or 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.

Bore	..... 4.00 in.	102 mm
Stroke	..... 5.125 in.	130 mm
Displacement	..... 773 cu.in.	12,7 lit
Compression ratio	..... 6.5:1	6,5:1
Width	..... 32.5 in.	825 mm
Height	..... 34.2 in.	869 mm
Length	..... 67.0 in.	1 702 mm
Frontal area	..... 5.6 sq.ft.	0,52 m ²
Weight	..... 760 lb.	345 kg
Weight/horsepower	..... 1.46 lb./h.p.	0,66 kg/hp
Fuel consumption (cr.)	..... 0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	..... 0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	..... 91/96 grade	91/96 grade
Oil grade (viscosity)	..... 100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	..... 0.67 h.p./cu.in.	40,9 hp/lit
Output/piston area	..... 3.44 h.p./sq.in.	0,53 hp/cm ²
Piston speed (max.)	..... 2,690 ft./min.	13,2 m/sec
B.m.e.p. (max.)	..... 168 lb./sq.in.	11,8 kg/cm ²
Rating (take-off)	..... 520 h.p./3,150 r.p.m./42,0 in. (1 067 mm) Hg. boost	
Rating (military)	..... 520 h.p./3,150 r.p.m./12,000 ft. (3 700 m)	
Rating (normal)	..... 450 h.p./3,000 r.p.m./12,000 ft. (3 700 m)	
Rating (max. cruising)	..... 340 h.p./2,725 r.p.m./15,000 ft. (4 600 m)	



Ranger SGV-770D

Ranger SGV-770D

Model SGV-770D-5 (D series).

Type 12 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.

Construction 2-piece aluminum alloy crankcase. Al-Fin cylinders (steel barrels with integral aluminum alloy fins) and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece crankshaft with pendulum type vibration dampers supported in 7 plain bearings. Planetary reduction gear, ratio 0.60:1 or 0.42:1.

Supercharger Gear-driven 1-speed supercharger, ratio 8.85:1.

Carburation 1 Bendix-Stromberg QM-8A2 injection type carburetor with direct injection onto supercharger impeller. Automatic pressure regulator.

Ignition 1 Bendix-Scintilla DRN-6 dual magneto and 2 12-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 65-75 lb./sq.in. (4,6 - 5,3 kg/cm²). Dry sump.

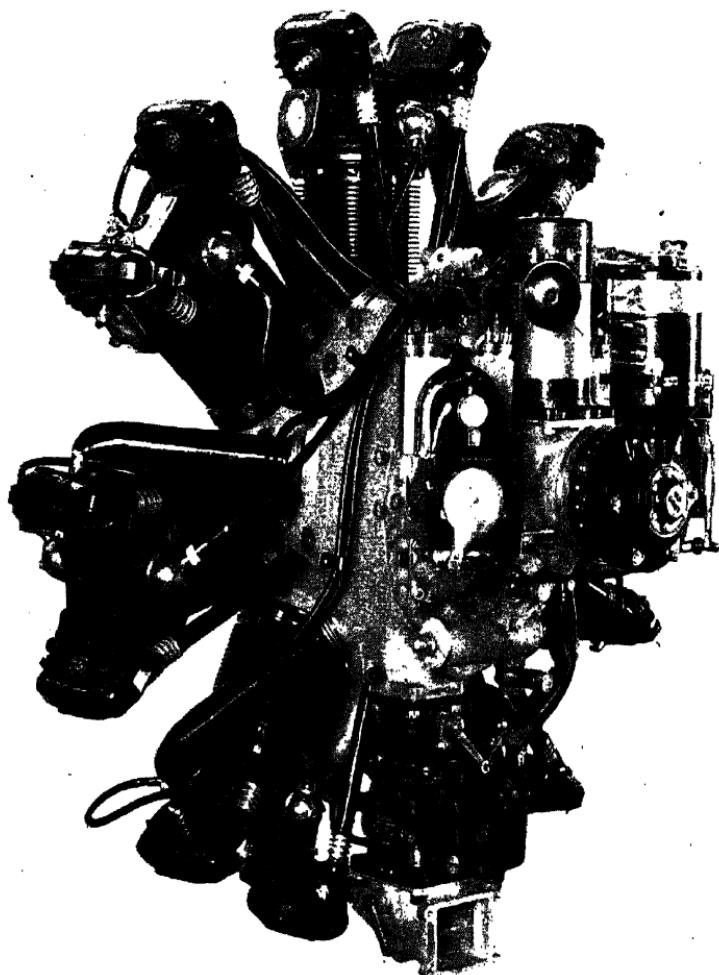
Starter Optional. Eclipse E-160 or 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.

Bore	4.00 in.	102 mm
Stroke	5.125 in.	130 mm
Displacement	773 cu.in.	12,7 lit
Compression ratio	6.5:1	6,5:1
Width	33.3 in.	846 mm
Height	31.1 in.	789 mm
Length	74.9 in.	1 903 mm
Frontal area	5.0 sq.ft.	0,46 m ²
Weight	870 lb.	394 kg
Weight/horsepower	1.24 lb./h.p.	0,56 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.91 h.p./cu.in.	55,1 hp/lit
Output/piston area	4.64 h.p./sq.in.	0,72 hp/cm ²
Piston speed (max.)	3,075 ft./min.	15,6 m/sec
B.m.e.p. (max.)	200 lb./sq.in.	14,0 kg/cm ²

Rating (take-off) 700 h.p./3,600 r.p.m.

Rating (normal) 600 h.p./3,300 r.p.m./8,000 ft. (2 400 m)

Rating (max. cruising) .. 450 h.p./2,985 r.p.m./13,000 ft. (4 000 m)



Warner Scarab

Warner Scarab

Model Scarab 50.

Type 7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 2.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 ball bearings.

Supercharger None.

Carburation 1 Holley 419 updraft carburetor.

Ignition 2 Bendix-Scintilla VMN-7D magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 50-90 lb./sq.in. (3,5-6,3 kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter.

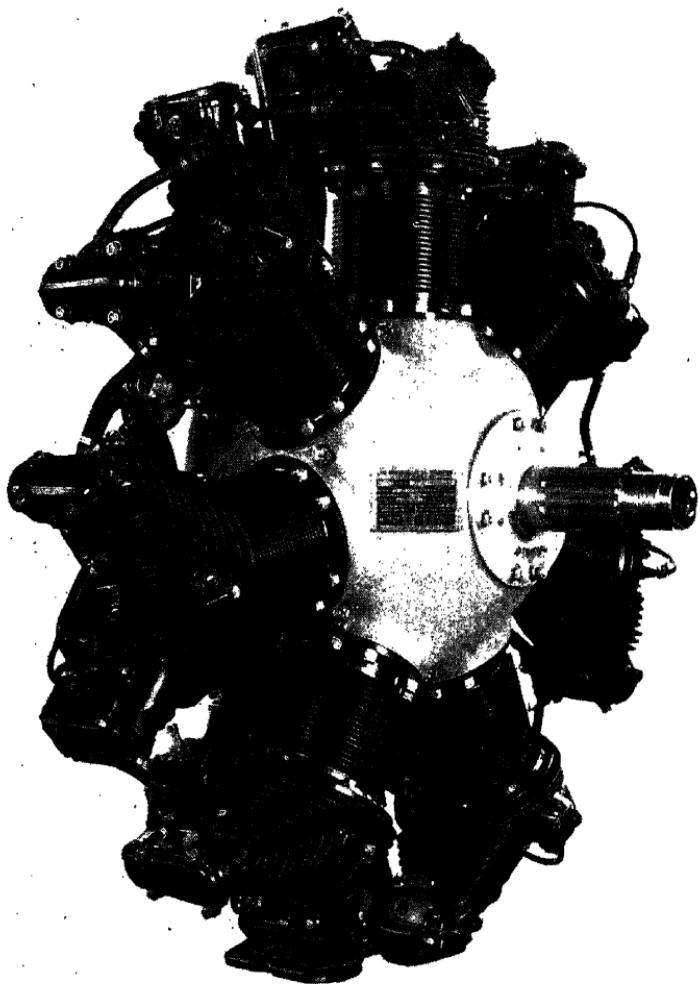
Bore	4.25 in.	108 mm
Stroke	4.25 in.	108 mm
Displacement	422 cu.in.	6,9 lit
Compression ratio	5.2:1	5,2:1
Diameter	36.6 in.	929 mm
Length	29.0 in.	737 mm
Frontal area	7.3 sq.ft.	0,68 m ²
Weight	285 lb.	129 kg
Weight/horsepower	2.17 lb./h.p.	0,98 kg/hp
Fuel consumption (cr.)	0.53 lb./h.p./hr.	240 g/hp/hr
Oil consumption (cr.)	0.025 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80-100 S.U. secs.	15,6 - 20,5 cs
Output/displacement	0.31 h.p./cu.in.	19,0 hp/lit
Output/piston area	1.32 h.p./sq.in.	0,20 hp/cm ²
Piston speed (max.)	1,482 ft./min.	7,8 m/sec
B.m.e.p. (max.)	114 lb./sq.in.	8,0 kg/cm ²

Rating (take-off) 131 h.p./2,160 r.p.m.

Rating (normal) 125 h.p./2,050 r.p.m./sea level

Rating (cruising) 90 h.p./1,900 r.p.m./sea level

Scarab 50-B: Same as Scarab 50. No starter. A.T.C. 2.



Warner Super Scarab 165

Warner Super Scarab 165

Model	Super Scarab 165.	
Type	7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 214.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 ball bearings. Equipped for fixed pitch propeller.	
Supercharger	None.	
Carburation	1 Holley 419 updraft carburetor.	
Ignition	2 Bendix-Scintilla VMN-7DF magnetos. 2 18-mm short reach spark plugs per cylinder.	
Lubrication	Pressure feed, 50-90 lb./sq.in. (3,5 - 6,3 kg/cm ²). Dry sump.	
Starter	Eclipse E-80 direct cranking electric starter.	
Bore	4.625 in.	117 mm
Stroke	4.25 in.	108 mm
Displacement	499 cu.in.	8,2 lit
Compression ratio	6.4:1	6,4:1
Diameter	37.2 in.	945 mm
Length	30.5 in.	775 mm
Frontal area	7.5 sq.ft.	0,70 m ²
Weight	341 lb.	155 kg
Weight/horsepower	1.95 lb./h.p.	0,88 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	260 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	80-100 S.U. secs.	15,6 - 20,5 cs
Output/displacement	0.35 h.p./cu.in.	21,3 hp/lit
Output/piston area	1.48 h.p./sq.in.	0,23 hp/cm ²
Piston speed (max.)	1,594 ft./min.	8,1 m/sec
B.m.e.p. (max.)	123 lb./sq.in.	8,6 kg/cm ²
Rating (take-off)	175 h.p./2,250 r.p.m.	
Rating (normal)	165 h.p./2,100 r.p.m./sea level	
Rating (cruising)	127 h.p./1,900 r.p.m./sea level	

Super Scarab 165-A: Same as Super Scarab 165. A.T.C. 214.

Super Scarab 165-B: Same as Super Scarab 165. Equipped for 2-position controllable pitch propeller. A.T.C. 214.

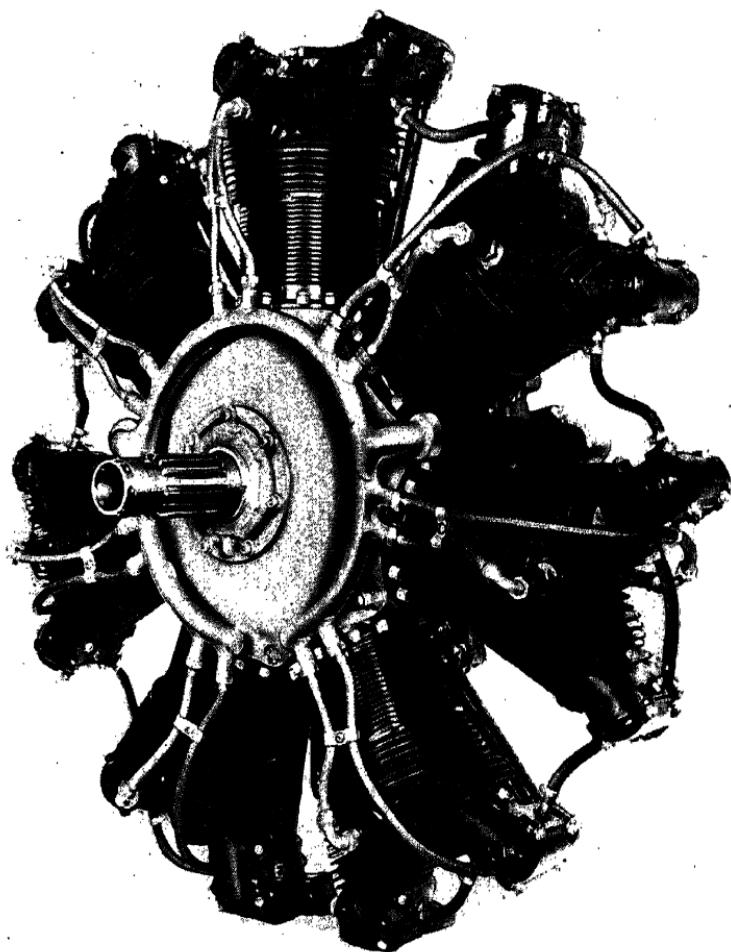
Super Scarab 165-D: Same as Super Scarab 165. Equipped for constant speed propeller. A.T.C. 214.

Super Scarab 165-E: Same as Super Scarab 165. Hand starter. A.T.C. 214.

Super Scarab 165-G: Similar to Super Scarab 165. Short front crankcase and short crankshaft. A.T.C. 214.

Super Scarab 165-AE: Same as Super Scarab 165-A. Hand starter. A.T.C. 214.

Super Scarab 165-BE, 165-DE: Same as Super Scarab 165-B. Hand starter. A.T.C. 214.



Warner Super Scarab 185

Warner Super Scarab 185

Model	Super Scarab 185.
Type	7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. pending.
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 ball bearings. Equipped for fixed pitch propeller.
Supercharger	None.
Carburation	1 Holley 419 updraft carburetor.
Ignition	2 Bendix-Scintilla VMN-7DF magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 70 lb./sq.in. (4,9 kg/cm ²). Dry sump.
Starter	Optional. Eclipse E-80 direct cranking electric starter can be used.
Bore	4.875 in. 124 mm
Stroke	4.25 in. 108 mm
Displacement	555 cu.in. 9,1 lit
Compression ratio	6.2:1 6.2:1
Diameter	37.2 in. 945 mm
Length	30.5 in. 775 mm
Frontal area	7.5 sq.ft. 0,70 m ²
Weight	350 lb. 159 kg
Weight/horsepower	1.75 lb./h.p. 0,79 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr. 245 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr. 9 g/hp/hr
Gasoline grade	73 octane 73 octane
Oil grade (viscosity)	80-120 S.U. secs. 15,6-25,1 cs
Output/displacement	0.36 h.p./cu.in. 22,0 hp/lit
Output/piston area	1.53 h.p./sq.in. 0,24 hp/cm ²
Piston speed (max.)	1,753 ft./min. 8,9 m/sec
B.m.e.p. (max.)	115 lb./sq.in. 8,1 kg/cm ²
Rating (take-off)	200 h.p./2,475 r.p.m.
Rating (normal)	180 h.p./2,100 r.p.m./sea level
Rating (cruising)	145 h.p./1,910 r.p.m./sea level

Super Scarab 185-A: Same as Super Scarab 185.

Super Scarab 185-B: Same as Super Scarab 185. Equipped for 2-position controllable pitch propeller.

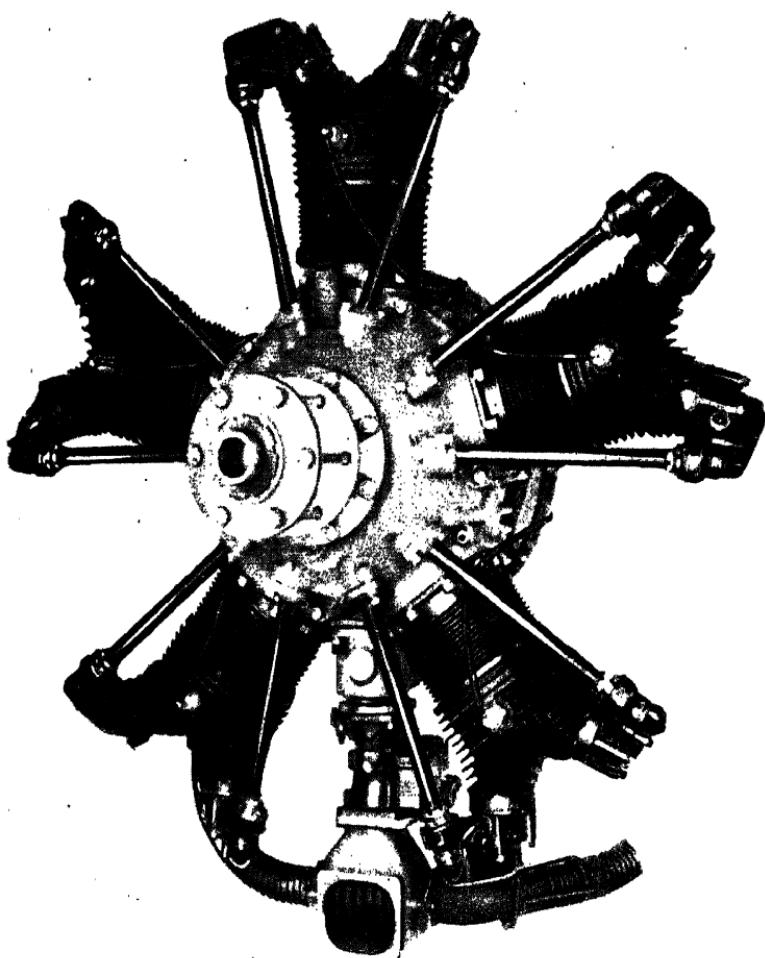
Super Scarab 185-D: Same as Super Scarab 185. Equipped for constant speed propeller.

Super Scarab 185-E: Same as Super Scarab 185. Hand starter.

Super Scarab 185-G: Similar to Super Scarab 185. Short front crankcase and short crankshaft.

Super Scarab 185-AE: Same as Super Scarab 185-A. Hand starter.

Super Scarab 185-BE, 185-DE: Same as Super Scarab 185-B. Hand starter.



White R-275S

White R-275SModel **R-275S.**

Type 5 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. pending.

Construction 3-piece magnesium alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 3 ball-bearings and 1 plain bearing.

Supercharger None.

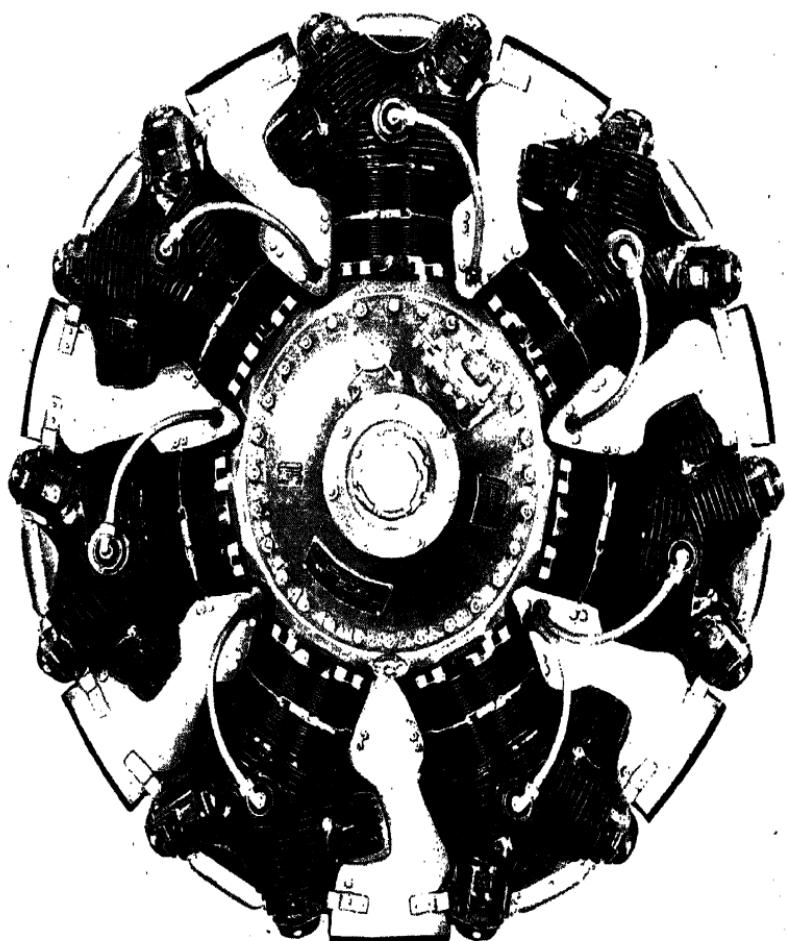
Carburation 1 Bendix-Stromberg NA-S pressure type updraft carburetor.

Ignition 2 Edison-Splitdorf RM-5 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system optional.

Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm²). Dry sump.

Starter Optional. Eclipse E-80 direct cranking electric starter or Eclipse 390 hand starter can be used.

Bore	4.125 in.	105 mm
Stroke	4.00 in.	102 mm
Displacement	266 cu.in.	4,3 lit
Compression ratio	6.2:1	6,2:1
Diameter	34.2 in.	869 mm
Length	23.9 in.	607 mm
Frontal area	6.4 sq.ft.	0,60 m ²
Weight	192 lb.	87 kg
Weight/horsepower	1.67 lb./h.p.	0,76 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	0.014 lb./h.p./hr.	6 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.43 h.p./cu.in.	26,7 hp/lit
Output/piston area	1.72 h.p./sq.in.	0,27 hp/cm ²
Piston speed (max.)	1,533 ft./min.	7,8 m/sec
B.m.e.p. (max.)	148 lb./sq.in.	10,4 kg/cm ²
Rating (take-off)	115 h.p./2,300 r.p.m.	
Rating (normal)	115 h.p./2,300 r.p.m./sea level	
Rating (cruising)	86 h.p./2,100 r.p.m./sea level	



Wright Whirlwind R-760

Wright Whirlwind R-760Model **R-760 E2.**

Type 7 cylinders, 1-row radial, air cooled, direct drive, ground boosted, 4-cycle. A.T.C. 155.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger Gear-driven ground blower, ratio 9.17:1.

Carburation 1 Bendix-Stromberg NA-R7A updraft carburetor.

Ignition 2 Bendix-Scintilla VMN-7DE or American Bosch SF7RU-1 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60-80 lb./sq.in. (4,2-5,6 kg/cm²). Dry sump.

Starter Eclipse E-160 direct cranking electric starter.

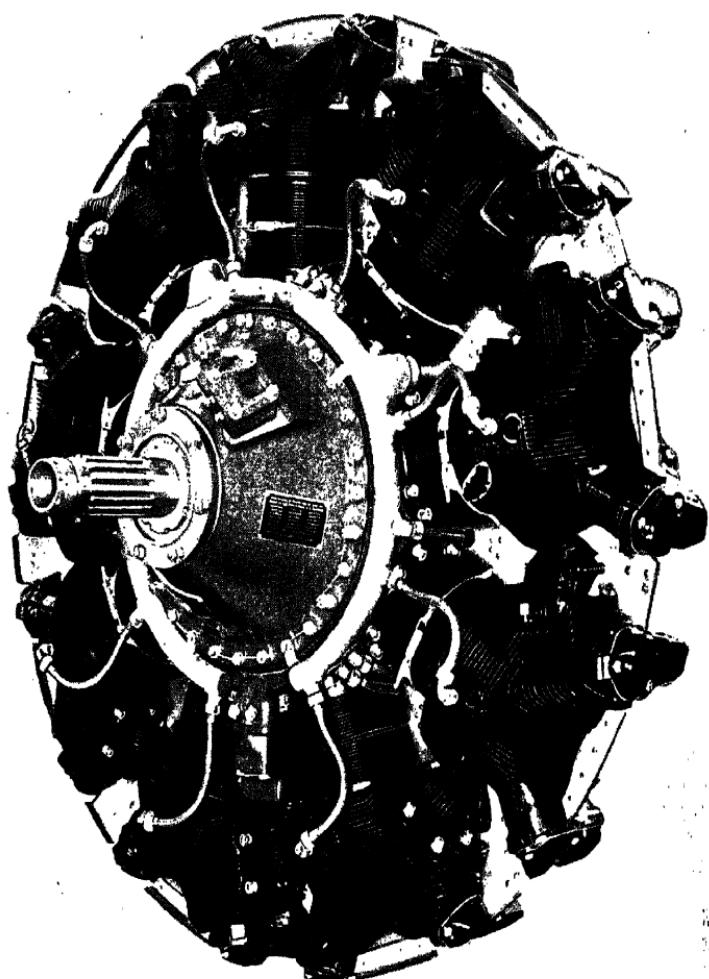
Bore	5.00 in.	127 mm
Stroke	5.50 in.	140 mm
Displacement	756 cu.in.	12,4 lit
Compression ratio	6.3:1	6,3:1
Diameter	45.0 in.	1 143 mm
Length	42.4 in.	1 078 mm
Frontal area	11.0 sq.ft.	1,02 m ²
Weight	570 lb.	258 kg
Weight/horsepower	1.63 lb./h.p.	0,70 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.46 h.p./cu.in.	28,1 hp/lit
Output/piston area	2.54 h.p./sq.in.	0,39 hp/cm ²
Piston speed (max.)	2,200 ft./min.	11,2 m/sec
B.m.e.p. (max.)	153 lb./sq.in.	10,8 kg/cm ²

Rating (take-off) 350 h.p./2,400 r.p.m.

Rating (normal) 320 h.p./2,200 r.p.m./sea level

Rating (max. cruising) 225 h.p./2,000 r.p.m./sea level

R-760 E1: 300 h.p./2,250 r.p.m./take-off; 285 h.p./2,100 r.p.m./sea level normal rating. Direct drive. Ground blower, ratio 7.05:1. 73-octane gasoline. A.T.C. 94.



Wright Whirlwind R-975

Wright Whirlwind R-975Model **R-975 E3.**

Type 9 cylinders, 1-row radial, air cooled, direct drive, supercharged, 4-cycle. A.T.C. 125.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger Gear-driven 1-speed supercharger, ratio 10.15:1.

Carburation 1 Bendix-Stromberg NA-R9A updraft carburetor.

Ignition 2 Bendix-Scintilla VAG-9DFR magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60-80 lb./sq.in. (4,2-5,6 kg/cm²). Dry sump.

Starter Eclipse E-160 direct cranking electric starter.

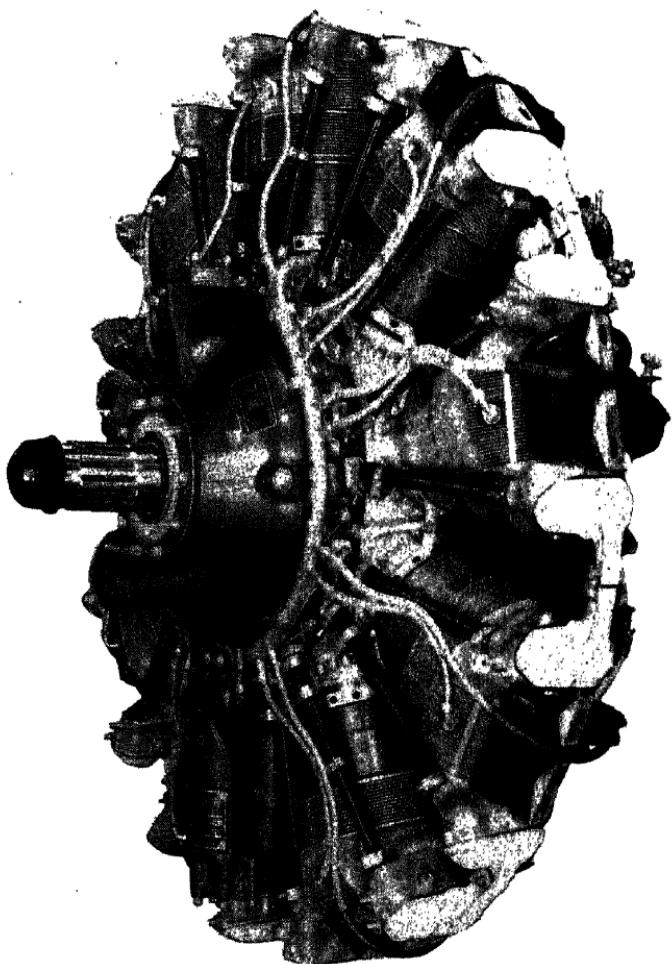
Bore	5.00 in.	127 mm
Stroke	5.50 in.	140 mm
Displacement	973 cu.in.	15,9 lit
Compression ratio	6.3:1	6,3:1
Diameter	45.0 in.	1 143 mm
Length	41.2 in.	1 046 mm
Frontal area	11.0 sq.ft.	1,02 m ²
Weight	675 lb.	306 kg
Weight/horsepower	1.50 lb./h.p.	0,68 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.47 h.p./cu.in.	28,2 hp/lit
Output/piston area	2.54 h.p./sq.in.	0,39 hp/cm ²
Piston speed (max.)	2,062 ft./min.	10,5 m/sec
B.m.e.p. (max.)	163 lb./sq.in.	11,5 kg/cm ²

Rating (take-off) 450 h.p./2,250 r.p.m./36.5 in. (927 mm) Hg. boost

Rating (normal) 420 h.p./2,200 r.p.m./1,400 ft. (400 m)

Rating (max. cruising) 325 h.p./2,000 r.p.m./no specified altitude.

R-975 E1: 365 h.p./2,100 r.p.m./take-off and normal rating at sea level.
 Direct drive. Ground blower, ratio 7.8:1. 73-octane gasoline.
 A.T.C. 87.



Wright Cyclone 9 R-1820 (H series)

Wright Cyclone 7 R-1300

Model **735C7BA1.**

Type 7 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.

Construction 2-piece steel crankcase. Cylinders with steel barrels with W-type aluminum alloy fins, and forged aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crank-shaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.67:1.

Supercharger Gear-driven 2-speed supercharger, ratios 7.21:1 and 8.69:1.

Carburation 1 Bendix-Stromberg PD-9E1 2-barrel pressure type downdraft carburetor.

Ignition 2 American Bosch SF7LU magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

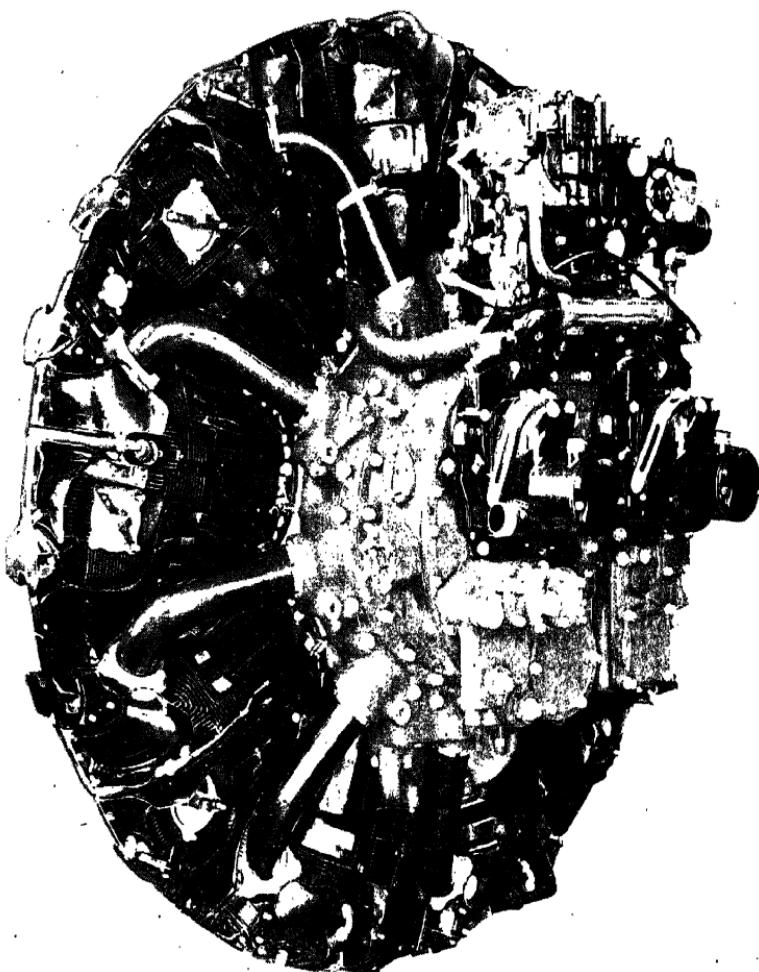
Lubrication Pressure feed, 70 lb./sq.in. (4,9 kg/cm²). Dry sump.

Starter Optional. Eclipse E-160 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.

Bore	.....	6.125 in.	155 mm
Stroke	.....	6.3125 in.	160 mm
Displacement	.....	1,300 cu.in.	21,3 lit
Compression ratio	.....	6.2:1	6,2:1
Diameter	.....	52.1 in.	1 323 mm
Length	.....	48.2 in.	1 224 mm
Frontal area	.....	14.8 sq.ft.	1,38 m ²
Weight	.....	950 lb.	431 kg
Weight/horsepower	.....	1.36 lb./h.p.	0,62 kg/hp
Fuel consumption (cr.)	.....	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	.....	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	.....	91/96 grade	91/96 grade
Oil grade (viscosity)	.....	120 S.U. secs.	25,1 cs
Output/displacement	.....	0.54 h.p./cu.in.	32,9 hp/lit
Output/piston area	.....	3.39 h.p./sq.in.	0,52 hp/cm ²
Piston speed (max.)	.....	2,735 ft./min.	13,7 m/sec
B.m.e.p. (max.)	.....	164 lb./sq.in.	11,5 kg/cm ²
Rating (take-off)	.....	700 h.p./2,600 r.p.m./sea level to 7,600 ft. (2 300 m)	
Rating (normal, low)	.....	600 h.p./2,400 r.p.m./sea level to 9,500 ft. (2 900 m)	
Rating (normal, high)	.....	500 h.p./2,400 r.p.m./14,700 - 17,000 ft. (4 500 - 5 200 m)	
Rating (cruising, low)	.....	390 h.p./2,100 r.p.m./sea level to 16,200 ft. (4 900 m)	
Rating (cruising, high)	.....	325 h.p./2,100 r.p.m./20,500 - 22,400 ft. (6 200 - 6 800 m)	

Optional equipment: Cooling fan driven at propeller speed, weight 50 lb. (22 kg). Gear-driven 1-speed supercharger instead of 2-speed supercharger.

Note. No photograph of the Wright Cyclone 7 is available as of January, 1945. It is similar in construction to the Wright Cyclone 9 shown on the opposite page.

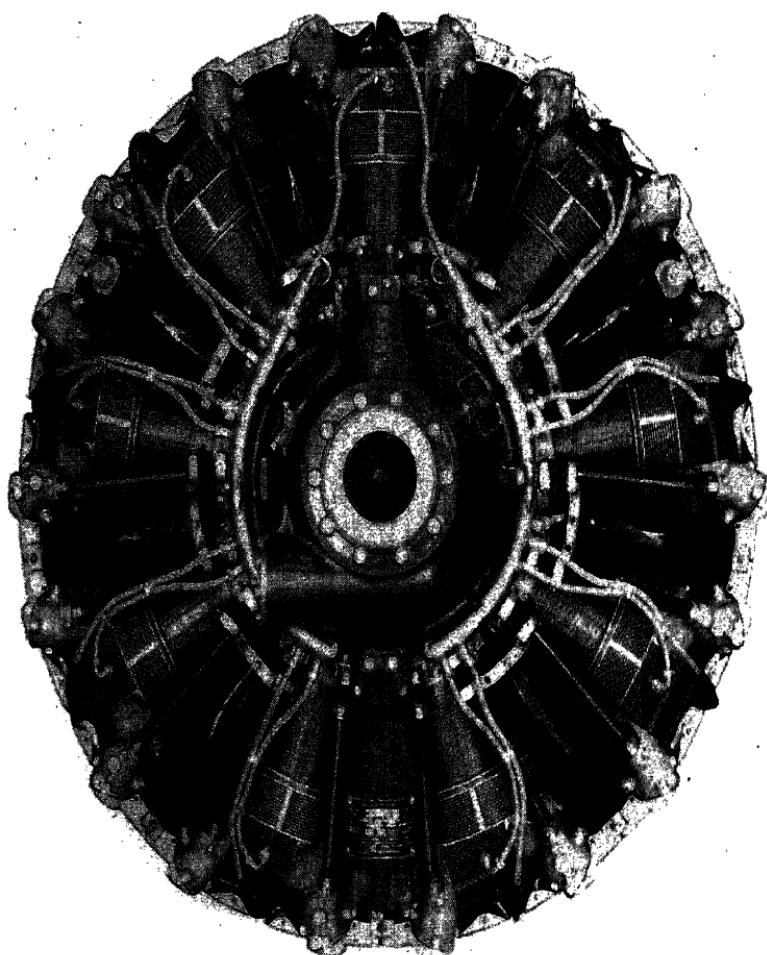


Wright Cyclone 9 R-1820 (G-series)

Wright Cyclone 9 R-1820 (G series)

Model	704C9GC (G205A).	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. 219.	
Construction	2-piece steel crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.56:1 or 0.67:1.	
Supercharger	Gear-driven 2-speed supercharger, ratios 7.14:1 and 10.0:1.	
Carburation	1 Bendix-Stromberg PD-12H3 2-barrel injection type downdraft carburetor with automatic mixture control and 4-position manual mixed control. Optional: 1 Holley 1375F variable venturi downdraft carburetor.	
Ignition	2 Bendix-Scintilla SF9LN-3 or American Bosch SF9LU-3 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60-75 lb./sq.in. (4,6 - 5,3 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse E-160 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.	
Bore	6.125 in.	155 mm
Stroke	6.875 in.	175 mm
Displacement	1,823 cu.in.	29,9 lit
Compression ratio	6.7:1	6,7:1
Diameter	55.1 in.	1 400 mm
Length	50.0 in.	1 270 mm
Frontal area	16.6 sq.ft.	1,53 m ²
Weight	1,320 lb.	599 kg
Weight/horsepower	1.10 lb./h.p.	0.50 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.66 h.p./cu.in.	40,1 hp/lit
Output/piston area	4.52 h.p./sq.in.	0,70 hp/cm ²
Piston speed (max.)	2,865 ft./min.	14,6 m/sec
B.m.e.p. (max.)	209 lb./sq.in.	14,7 kg/cm ²
Rating (take-off)	1,200 h.p./2,500 r.p.m./45.5 in. (1 156 mm) Hg. boost	
Rating (normal, low)	1,000 h.p./2,300 r.p.m./6,900 ft. (2 100 m)	
Rating (normal, high)	900 h.p./2,300 r.p.m./15,200 ft. (4 600 m)	
Rating (max. cruising)	700 h.p./2,000 r.p.m./no specified altitude	

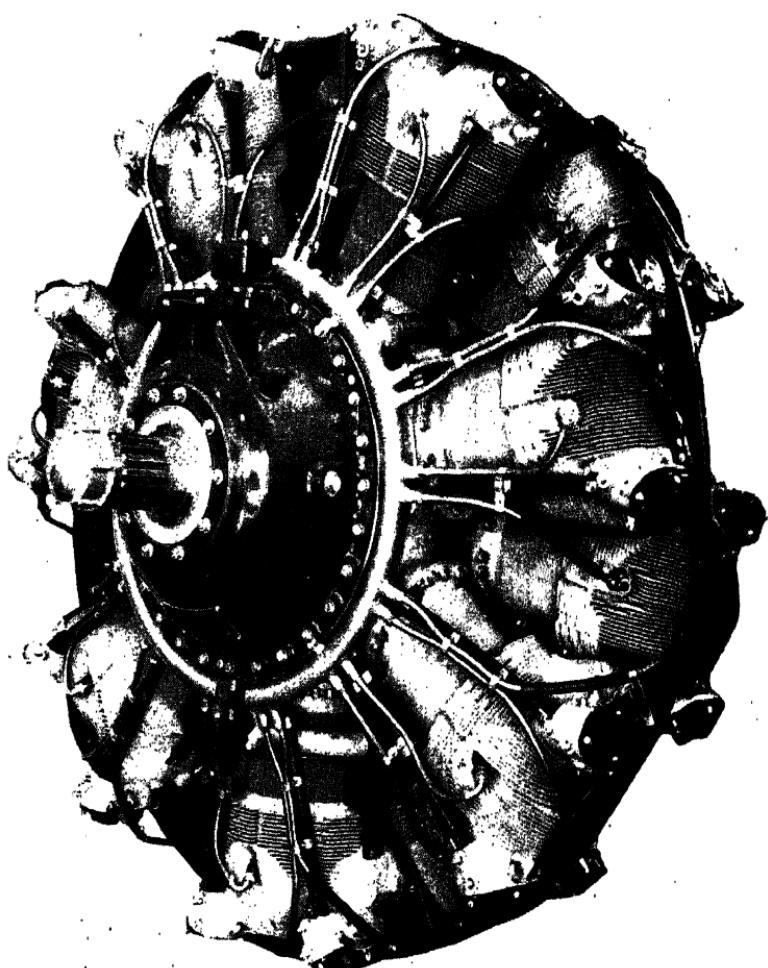
Additional models of Wright Cyclone 9 (G series) engines will be found on page 173.



Wright Cyclone 9 R-1820 (H series)

Wright Cyclone 9 R-1820 (H series)

Model	806 C9HC1.	
Type	9 cylinder, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece steel crankcase. Cylinders with steel barrels with W-type aluminum alloy fins, and forged aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.56:1 or 0.67:1.	
Supercharger	Gear-driven 2-speed supercharger, ratios 7.13:1 and 10.04:1.	
Carburation	1 Bendix-Stromberg PD-12K10 2-barrel injection type down-draft carburetor with automatic mixture control and 4-position manual mixture control.	
Ignition	2 Edison-Splitdorf SF9LD-1 or American Bosch SF9LU-3 magneto. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 65-75 lb./sq.in. (4,6 - 5,3 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse E-160 or 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.	
Bore	6.125 in.	155 mm
Stroke	6.875 in.	175 mm
Displacement	1,823 cu.in.	29,9 lit
Compression ratio	6.55:1	6,55:1
Diameter	55.1 in.	1 400 mm
Length	47.5 in.	1 207 mm
Frontal area	16.6 sq.ft.	1,53 m ²
Weight	1,333 lb.	605 kg
Weight/horsepower	0.99 lb./h.p.	0.45 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.74 h.p./cu.in.	45,1 hp/lit
Output/piston area	5.09 h.p./sq.in.	0.79 hp/cm ²
Piston speed (max.)	3,094 ft./min.	15,7 m/sec
B.m.e.p. (max.)	217 lb./sq.in.	15,2 kg/cm ²
Rating (take-off)	1,350 h.p./2,700 r.p.m./48.0 in. (1 219 mm) Hg. boost	
Rating (military, low)	1,300 h.p./2,600 r.p.m./4,000 ft. (1 200 m)	
Rating (military, high)	1,000 h.p./2,600 r.p.m./17,500 ft. (5 300 m)	
Rating (normal, low)	1,200 h.p./2,500 r.p.m./5,500 ft. (1 700 m)	
Rating (normal, high)	900 h.p./2,500 r.p.m./18,500 ft. (5 600 m)	
Rating (cruising)	780 h.p./2,200 r.p.m./no specified altitude	
805C9HC1 (H series):	1,350 h.p./2,700 r.p.m./take-off; 1,300 h.p./2,600 r.p.m./4,000 ft. (1 200 m) military rating; 1,200 h.p./2,500 r.p.m./5,000 ft. (1 500 m) normal rating. Reduction gear ratio 0.56:1 or 0.67:1. 1-speed supercharger, ratio 7.0:1. 100/130 grade gasoline. Note: This 1-speed engine can be equipped with a turbo-supercharger.	

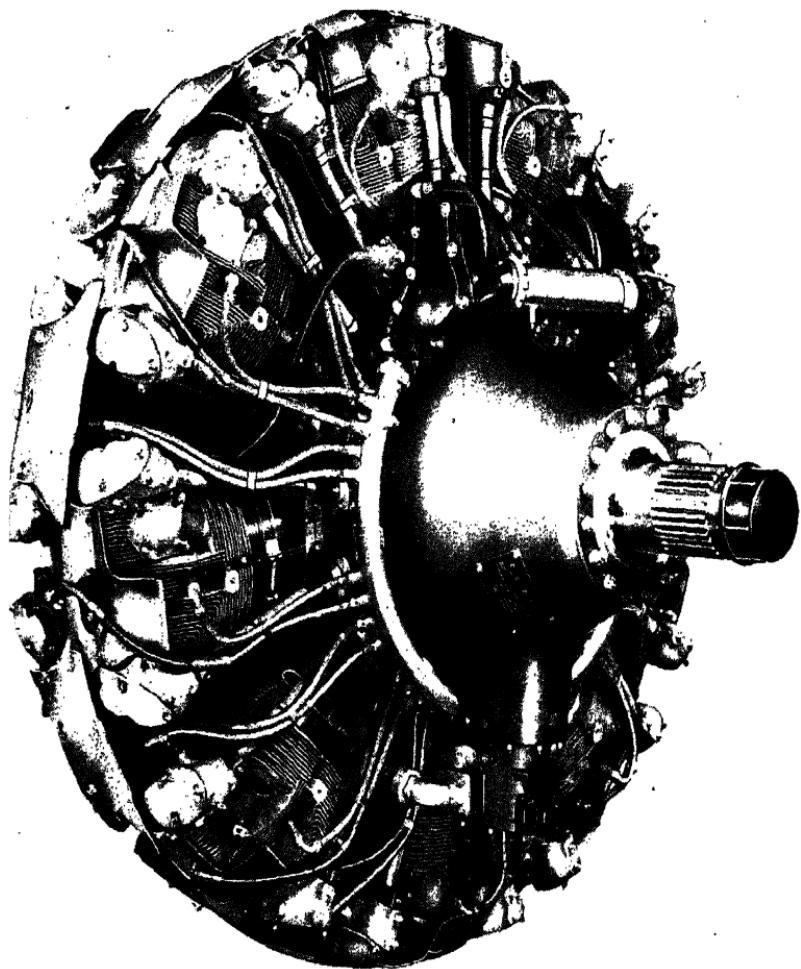


Wright Cyclone 14 R-2600

Wright Cyclone 14 R-2600

Model	776 C14BB (B series).
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.
Construction	3-piece steel crankcase. Cylinders with steel barrels with W-type aluminum alloy fins, and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary reduction gear, ratio 0.56:1.
Supercharger	Gear-driven 2-speed supercharger, ratios 7.06:1 and 10.06:1.
Carburation	1 Bendix-Stromberg PR-48A1 pressure type downdraft carburetor with automatic mixture control.
Ignition	2 American Bosch SF14LU-10 magnetos. 2 18 mm long reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 75-90 lb./sq.in. (5,3 - 6,3 kg/cm ²). Dry sump.
Starter	Optional. Eclipse E-160 or 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.
Bore	6.125 in. 155 mm
Stroke	6.3125 in. 160 mm
Displacement	2,603 cu.in. 42,7 lit
Compression ratio	6.9:1 6,9:1
Diameter	54.1 in. 1 374 mm
Length	66.1 in. 1 678 mm
Frontal area	16.0 sq.ft. 1,48 m ²
Weight	2,045 lb. 927 kg
Weight/horsepower	1.07 lb./h.p. 0,48 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr. 210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr. 9 g/hp/hr
Gasoline grade	100/130 grade 100/130 grade
Oil grade (viscosity)	120 S.U. secs. 25,1 cs
Output/displacement	0.73 h.p./cu.in. 44,5 hp/lit
Output/piston area	4.61 h.p./sq.in. 0,71 hp/cm ²
Piston speed (max.)	2,946 ft./min. 14,9 m/sec
B.m.e.p. (max.)	206 lb./sq.in. 14,5 kg/cm ²
Rating (take-off)	1,900 h.p./2,800 r.p.m./48.5 in. (1 232 mm) Hg. boost
Rating (military, low)	1,750 h.p./2,600 r.p.m./3,200 ft. (1 000 m)
Rating (military, high)	1,450 h.p./2,600 r.p.m./15,000 ft. (4 600 m)
Rating (normal, low)	1,600 h.p./2,400 r.p.m./5,000 ft. (1 500 m)
Rating (normal, high)	1,350 h.p./2,400 r.p.m./14,800 ft. (4 500 m)
Rating (cruising)	1,050 h.p./2,100 r.p.m./no specified altitude

Additional models of Wright Cyclone 14 engines will be found on page 173.

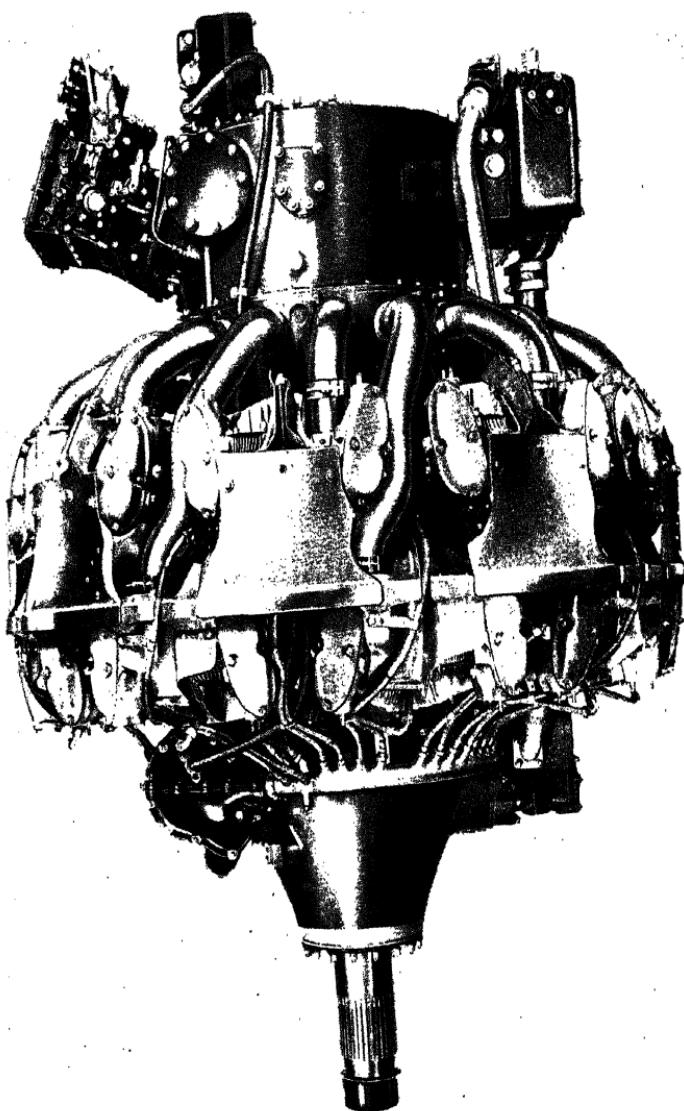


Wright Cyclone 18 R-3350

Wright Cyclone 18 R-3350

Model	711C18BA2 (B series).	
Type	18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	3-piece steel crankcase. Cylinders with steel barrels with W-type aluminum alloy fins, and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crank-shaft supported in 3 roller bearings. Planetary reduction gear, ratio 0.44:1 or 0.56:1.	
Supercharger	Gear-driven 2-speed supercharger, ratios 6.61:1 and 8.81:1.	
Carburation	1 Chandler-Evans 58CPB4 variable venturi pressure type down-draft carburetor with automatic mixture control.	
Ignition	1 Bendix-Scintilla DF18LN-1 dual magneto and 2 18-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60-70 lb./sq.in. (4.2-4.9 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse E-160 or 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.	
Bore	6.125 in.	155 mm
Stroke	6.3125 in.	160 mm
Displacement	3,347 cu.in.	54.9 lit
Compression ratio	6.85:1	6.85:1
Diameter	55.8 in.	1 417 mm
Length	76.2 in.	1 935 mm
Frontal area	17.0 sq.ft.	1.57 m ²
Weight	2,670 lb.	1 211 kg
Weight/horsepower	1.21 lb./h.p.	0.55 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	120 S.U. secs.	25.1 cs
Output/displacement	0.66 h.p./cu.in.	40.1 hp/lit
Output/piston area	4.15 h.p./sq.in.	0.64 hp/cm ²
Piston speed (max.)	2,946 ft./min.	14.9 m/sec
B.m.e.p. (max.)	187 lb./sq.in.	13.1 kg/cm ²
Rating (take-off)	2,200 h.p./2,800 r.p.m./48.0 in. (1 219 mm) Hg. boost	
Rating (normal, low)	2,000 h.p./2,400 r.p.m./4,500 ft. (1 400 m)	
Rating (normal, high)	1,800 h.p./2,400 r.p.m./14,000 ft. (4 300 m)	
Rating (cruising)	1,300 h.p./2,100 r.p.m./no specified altitude	

670C18BA (B series): 2,200 h.p./2,800 r.p.m./take-off; 2,000 h.p./2,400 r.p.m./3,000 ft. (900 m) normal rating. Reduction gear ratio 0.44:1 or 0.56:1. 1-speed supercharger, ratio 6.06:1. 100/130 grade gasoline. Note: This 1-speed engine can be turbo-supercharged. When used in the Boeing B-19 Superfortress Army Air Forces long-range heavy bomber it is equipped with 2 General Electric turbo-superchargers.



Wright Cyclone 3350

Additional Models of Wright R-1820 (G series) Engines

(Continued from page 165)

C9GB (G100 series)

R-1820 567C9GB (G102A): 1,100 h.p./2,350 r.p.m./take-off; 1,100 h.p./2,350 r.p.m./1,500 ft. (450 m) military rating; 900 h.p./2,300 r.p.m./6,700 ft. (2 000 m) normal rating. Reduction gear ratio 0.69:1. 1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 169.

R-1820 566C9GB (G103A): 1,000 h.p./2,350 r.p.m./take-off; 1,000 h.p./2,350 r.p.m./ 8,000 ft. (2 400 m) military rating; 860 h.p./2,300 r.p.m./11,100 ft. (3 400 m) normal rating. Reduction gear ratio 0.69:1. 1-speed supercharger, 8.31:1. 91/96 grade gasoline. A.T.C. 180.

R-1820 564C9GB (G105A): 1,100 h.p./2,350 r.p.m./take-off; 1,100 h.p./2,350 r.p.m./1,500 ft. (500 m) and 800 h.p./2,350 r.p.m./17,100 ft. (5 200 m) military rating; 900 h.p./2,300 r.p.m./7,700 ft. (2 300 m) and 775 h.p./2,300 r.p.m./17,300 ft. (5 300 m) normal rating. Reduction gear ratio 0.69:1. 2-speed supercharger, ratios 7.14:1 and 10.0:1. 91/96 grade gasoline. A.T.C. 192.

R-1820 718C9GB1 (G105A): Same as R-1820 564C9GB. Reduction gear 0.67:1.

C9GC (G200 series)

R-1820 702C9GC (G202A): 1,200 h.p./2,500 r.p.m./take-off; 1,200 h.p./2,500 r.p.m./4,100 ft. (1 200 m) military rating; 1,000 h.p./2,300 r.p.m./6,900 ft. (2 100 m) normal rating. Reduction gear 0.67:1. 1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 219.

R-1820 728C9GC: 1,200 h.p./2,500 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./6,000 ft. (1 800 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 7.0:1. 91/96 grade gasoline. A.T.C. 219.

R-1820 730C9GC: 1,200 h.p./2,500 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./6,900 ft. (2 100 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 219.

R-1820 666C9GC: Similar to R-1820 702C9GC. Equipped with General Electric turbo-supercharger.

Additional Models of Wright R-2600 Engines

(Continued from page 169)

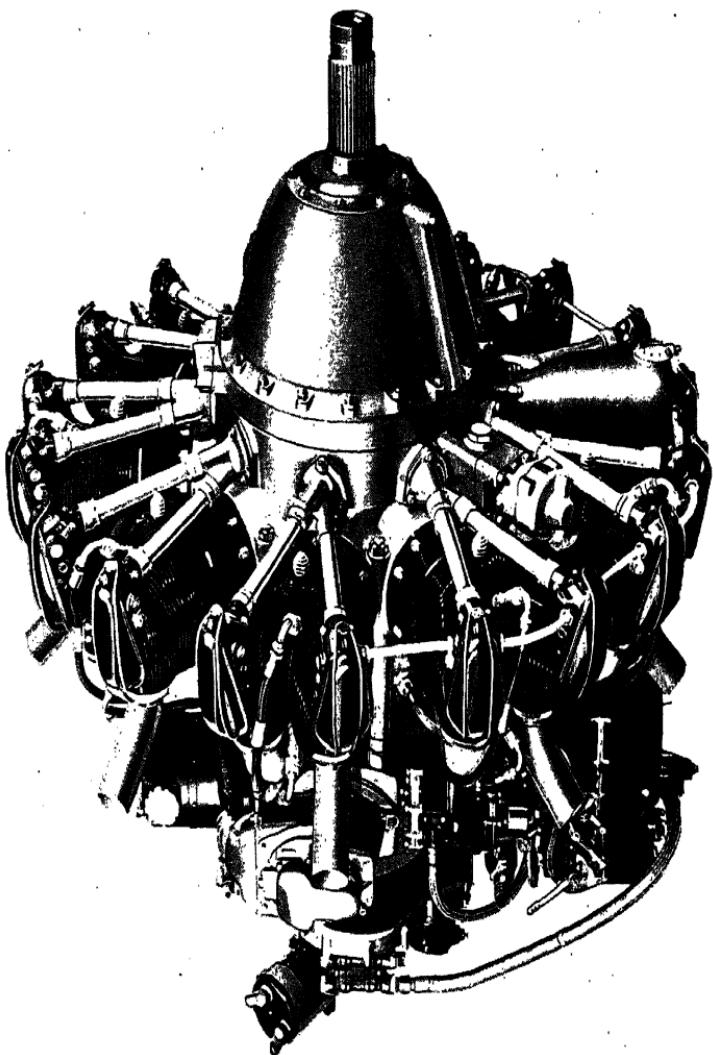
C14AC (A series)

R-2600 700C14AC (A5B): 1,600 h.p./2,400 r.p.m./take-off; 1,600 h.p./2,400 r.p.m./1,000 ft (300 m) and 1,400 h.p./2,400 r.p.m./10,000 ft. (3 000 m) military rating; 1,350 h.p./2,300 r.p.m./5,000 ft. (1 500 m) and 1,275 h.p./2,300 r.p.m./11,500 ft. (3 500 m) normal rating. Reduction gear ratio 0.56:1. 2-speed supercharger, ratios 7.14:1 and 10.0:1. 91/96 grade gasoline. A.T.C. pending.

C14BA (B series)

R-2600 585C14BA: 1,700 h.p./2,500 r.p.m./take-off; 1,700 h.p./2,500 r.p.m./4,100 ft. (1 200 m) military rating; 1,500 h.p./2,400 r.p.m./6,700 ft. (2 000 m) normal rating. Reduction gear ratio 0.44:1. 1-speed supercharger, ratio 7.03:1. 100/130 grade gasoline. A.T.C. 176.

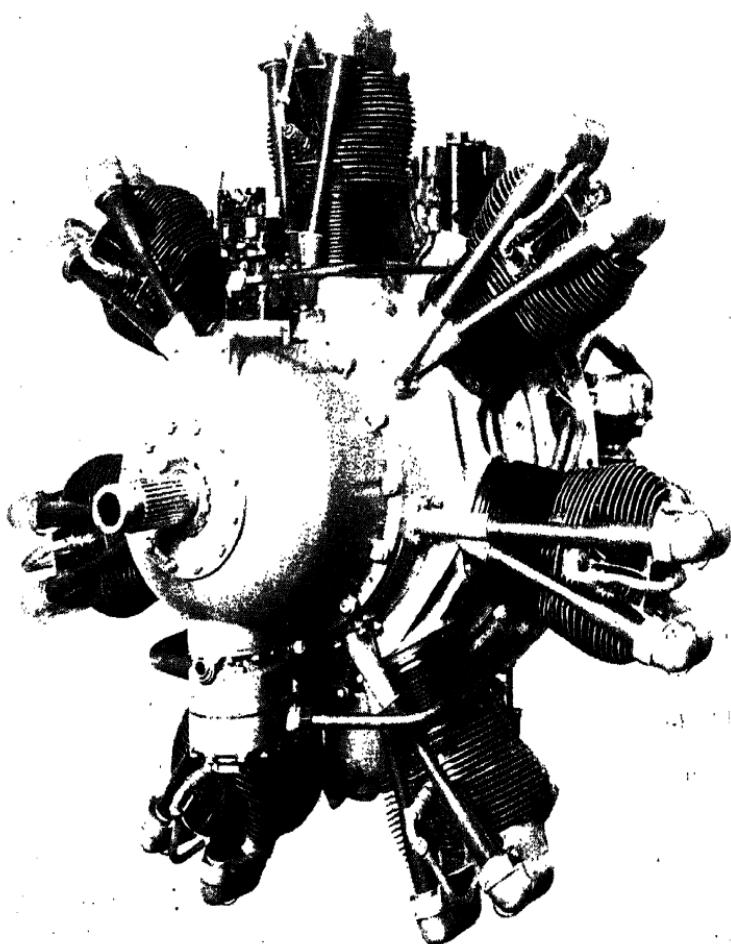
R-2600 586C14BA: 1,700 h.p./2,500 r.p.m./take-off; 1,700 h.p./2,500 r.p.m./4,100 ft. (1 200 m) and 1,450 h.p./2,500 r.p.m./14,100 ft. (4 300 m) military rating; 1,500 h.p./2,400 r.p.m./6,700 ft. (2 000 m) and 1,350 h.p./2,400 r.p.m./15,000 ft. (4 600 m) normal rating. Reduction gear ratio 0.56:1. 2-speed supercharger, ratios 7.06:1 and 10.02:1. 100/130 grade gasoline. A.T.C. 176.



Alvins Leonide

Alvis Leonides

Model	Leonides.
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.
Supercharger	Gear-driven 1-speed supercharger, ratio 6.5:1.
Carburation	1 S.U. AVT-22 2-barrel updraft carburetor with automatic boost control.
Ignition	2 B.T.H. C2SE9-S magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 80 lb./sq.in. (5,6 kg/cm ²). Dry sump.
Starter	Rotax N3EM electric inertia starter.
Bore	4.80 in. 122 mm
Stroke	4.41 in. 112 mm
Displacement	719 cu.in. 11,8 lit
Compression ratio	6.3:1 6,3:1
Diameter	41.5 in. 1 054 mm
Length	52.0 in. 1 321 mm
Frontal area	9.4 sq.ft. 0,87 m ²
Weight	708 lb. 321 kg
Weight/horsepower	1.57 lb./h.p. 0,71 kg/hp
Fuel consumption (cr.)	0.52 lb./h.p./hr. 235 g/hp/hr
Oil consumption (cr.)	0.007 lb./h.p./hr. 3 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230) 87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B) 20,5 cs
Output/displacement	0.63 h.p./cu.in. 38,1 hp/lit
Output/piston area	2.76 h.p./sq.in. 0,43 hp/cm ²
Piston speed (max.)	2,278 ft./min. 11,6 m/sec
B.m.e.p. (max.)	160 lb./sq.in. 11,2 kg/cm ²
Rating (take-off)	450 h.p./3,000 r.p.m./40.1 in. (1 018 mm) Hg. boost
Rating (normal)	435 h.p./3,000 r.p.m./8,250 ft. (2 500 m)
Rating (max. cruising)	415 h.p./3,000 r.p.m./9,750 ft. (3 000 m)



Armstrong Siddeley Cheetah

Armstrong Siddeley Cheetah**Cheetah XV.**

Model **Cheetah XV.**
 Type 7 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.73:1.

Supercharger Gear-driven 1-speed supercharger, ratio 6.5:1.

Carburation 1 Hobson AV70ME updraft carburetor with 2-position automatic mixture control and automatic boost control.

Ignition 2 B.T.H. SC7-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 55-90 lb./sq.in. (3.8 - 6.3 kg/cm²). Dry sump.

Starter Rotax N3EM electric starter.

Bore	5.25 in.	133 mm
Stroke	5.50 in.	140 mm
Displacement	.835 cu.in.	13.7 lit
Compression ratio	6.35:1	6.35:1
Diameter	47.7 in.	1 212 mm
Length	50.0 in.	1 270 mm
Frontal area	12.4 sq.ft.	1.15 m ²
Weight	805 lb.	365 kg
Weight/horsepower	1.20 lb./h.p.	0.54 kg/hp
Fuel consumption (cr.)	0.58 lb./h.p./hr.	265 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230)	87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.50 h.p./cu.in.	30.7 hp/lit
Output/piston area	2.77 h.p./sq.in.	0.43 hp/cm ²
Piston speed (max.)	2,337 ft./min.	11.9 m/sec
B.m.e.p. (max.)	155 lb./sq.in.	10.9 kg/cm ²

Rating (take-off) 420 h.p./2,550 r.p.m./38.0 in. (965 mm) Hg. boost

Rating (combat) 400 h.p./2,425 r.p.m./4,000 ft. (1 200 m)

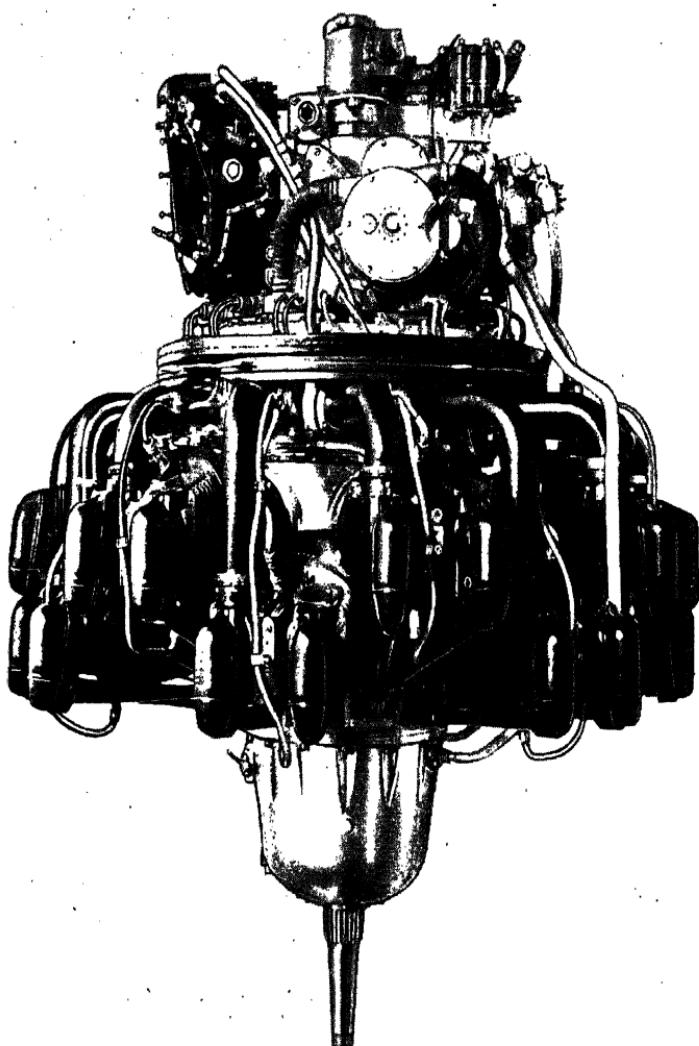
Rating (normal) 385 h.p./2,300 r.p.m./3,500 ft. (1 100 m)

Rating (cruising) 320 h.p./2,100 r.p.m./5,000 ft. (1 500 m)

Cheetah IX: 410 h.p./2,300 r.p.m./take-off; 350 h.p./2,425 r.p.m./7,300 ft. (2 200 m) combat rating. Direct drive. 1-speed supercharger, ratio 6.5:1. 87-octane gasoline.

Cheetah X: 410 h.p./2,300 r.p.m./take-off; 355 h.p./2,425 r.p.m./7,000 ft. (2 150 m) combat rating. Direct drive. 1-speed supercharger, ratio 6.5:1. 87-octane gasoline.

Cheetah XIX: 410 h.p./2,300 r.p.m./take-off; 380 h.p./2,300 r.p.m./4,000 ft. (1 200 m) combat rating. Direct drive. 1-speed supercharger, ratio 6.5:1. 87-octane gasoline.



Armstrong Siddeley Tiger

Armstrong Siddeley Tiger

Model **Tiger VIII.**

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.59:1.

Supercharger Gear-driven 2-speed supercharger, ratios 5.34:1 and 7.96:1.

Carburation 1 Hobson AIT87MA downdraft carburetor with 2-position automatic mixture control and boost control.

Ignition 2 B.T.H. SC14-2A magnetos, 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-100 lb./sq.in. (4,9 - 7,0 kg/cm²). Dry sump.

Starter Armstrong Siddeley electric inertia starter.

Bore	5.50 in.	140 mm
Stroke	6.00 in.	152 mm
Displacement	1,996 cu.in.	32,7 lit
Compression ratio	6.2:1	6,2:1
Diameter	50.8 in.	1 290 mm
Length	64.8 in.	1 646 mm
Frontal area	14.1 sq.ft.	1,31 m ²
Weight	1,290 lb.	585 kg
Weight/horsepower	1.40 lb./h.p.	0,64 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.026 lb./h.p./hr.	12 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230)	87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.46 h.p./cu.in.	28,1 hp/lit
Output/piston area	2.76 h.p./sq.in.	0,32 hp/cm ²
Piston speed (max.)	2,450 ft./min.	12,4 m/sec
B.m.e.p. (max.)	149 lb./sq.in.	10,5 kg/cm ²

Rating (take-off) 920 h.p./2,375 r.p.m./35.0 in. (889 mm) Hg. boost

Rating (normal, low) 860 h.p./2,450 r.p.m./6,750 ft. (2 100 m)

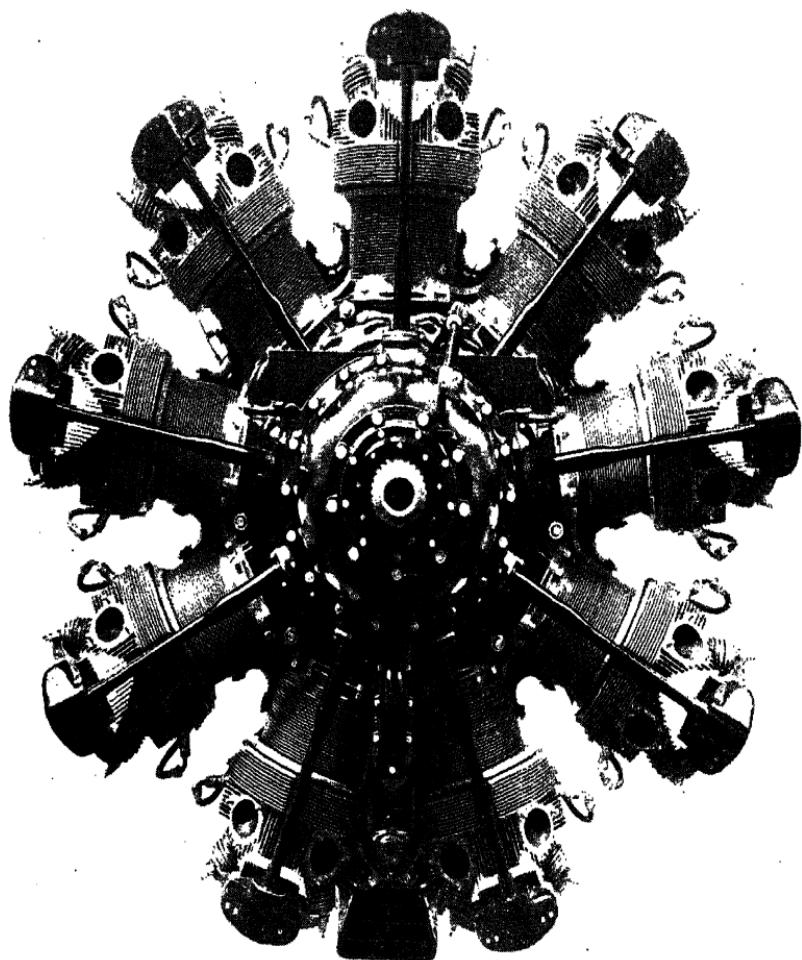
Rating (normal, high) 780 h.p./2,450 r.p.m./14,250 ft. (4 300 m)

Rating (cruising, low) 695 h.p./2,200 r.p.m./6,600 ft. (2 000 m)

Rating (cruising, high) 615 h.p./2,200 r.p.m./14,000 ft. (4 300 m)

Tiger IX: 880 h.p./2,375 r.p.m./take-off; 810 h.p./2,450 r.p.m./7,200 ft. (2 200 m) normal rating. Reduction gear ratio 0.59:1. 1-speed supercharger, ratio 5.4:1. 87-octane gasoline.

Tiger IXc: 935 h.p./2,375 r.p.m./take-off; 805 h.p./2,375 r.p.m./6,250 ft. (1 900 m) normal rating. Reduction gear ratio 0.59:1. 1-speed supercharger, ratio 5.4:1. 87-octane gasoline.



Bristol Mercury

Bristol Mercury

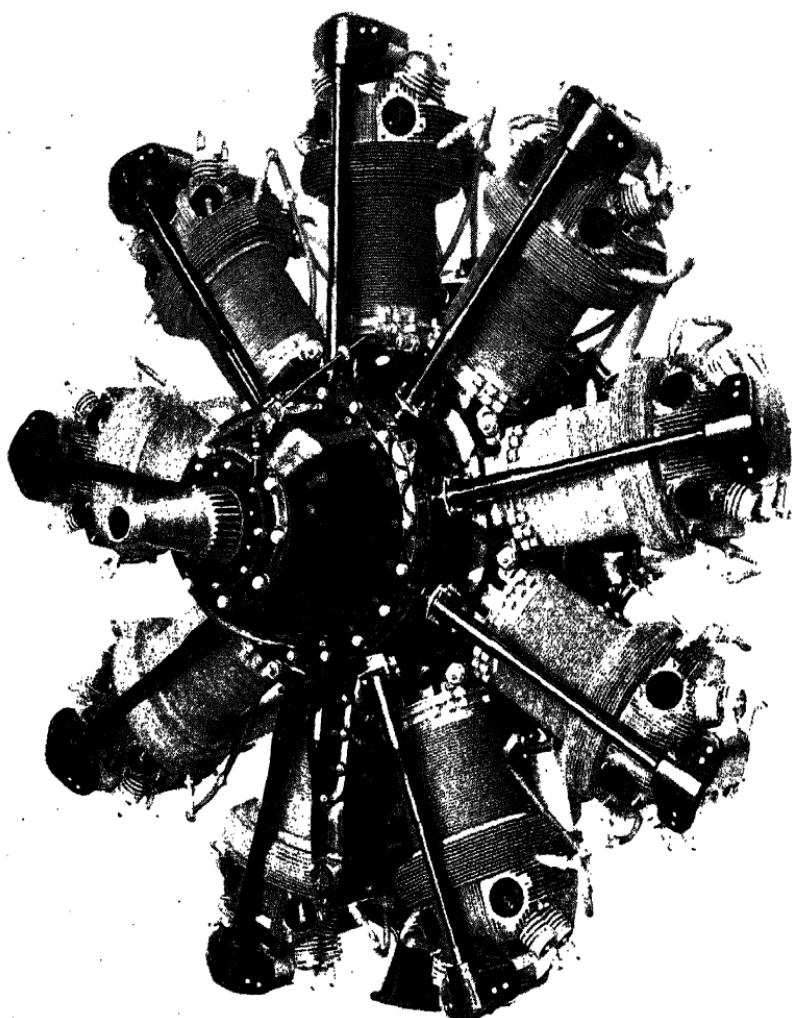
Model	Mercury XV (100/130 grade).	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.57:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 9.4:1.	
Carburation	1 Hobson AVT-85MB 2-barrel updraft carburetor with 3-stage boost control and 2-position automatic mixture control.	
Ignition	2 B.T.H. SC9-8 or Watford SP9-6 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 80 lb./sq.in. (5.6 kg/cm ²). Dry sump.	
Starter	Rotax E-160C or C-1231 electric starter.	
Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	1,520 cu.in.	24.9 lit
Compression ratio	6.25:1	6.25:1
Diameter	52.0 in.	1 321 mm
Length	58.5 in.	1 486 mm
Frontal area	14.7 sq.ft.	1.37 m ²
Weight	1,065 lb.	483 kg
Weight/horsepower	1.07 lb./h.p.	0.48 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.65 h.p./cu.in.	40.0 hp/lit
Output/piston area	4.25 h.p./sq.in.	0.66 hp/cm ²
Piston speed (max.)	2,979 ft./min.	15.1 m/sec
B.m.e.p. (max.)	187 lb./sq.in.	13.1 kg/cm ²
Rating (take-off)	905 h.p./2,750 r.p.m./48.2 in. (1 225 mm) Hg. boost	
Rating (military)	995 h.p./2,750 r.p.m./9,250 ft. (2 800 m)	
Rating (normal)	825 h.p./2,650 r.p.m./13,000 ft. (4 000 m)	
Rating (cruising)	590 h.p./2,400 r.p.m./16,000 ft. (4 900 m)	

Mercury XV (87-octane): 725 h.p./2,650 r.p.m./take-off; 840 h.p./2,750 r.p.m./14,000 ft. (4 300 m) military rating; 825 h.p./2,650 r.p.m./13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.572:1. 1-speed supercharger, ratio 9.4:1. 87-octane gasoline.

Mercury 25 (87-octane): Same as Mercury XV (87-octane).

Mercury 25 (100/130 grade): Same as Mercury XV (100/130 grade).

Additional models of Bristol Mercury engines will be found on page 191.



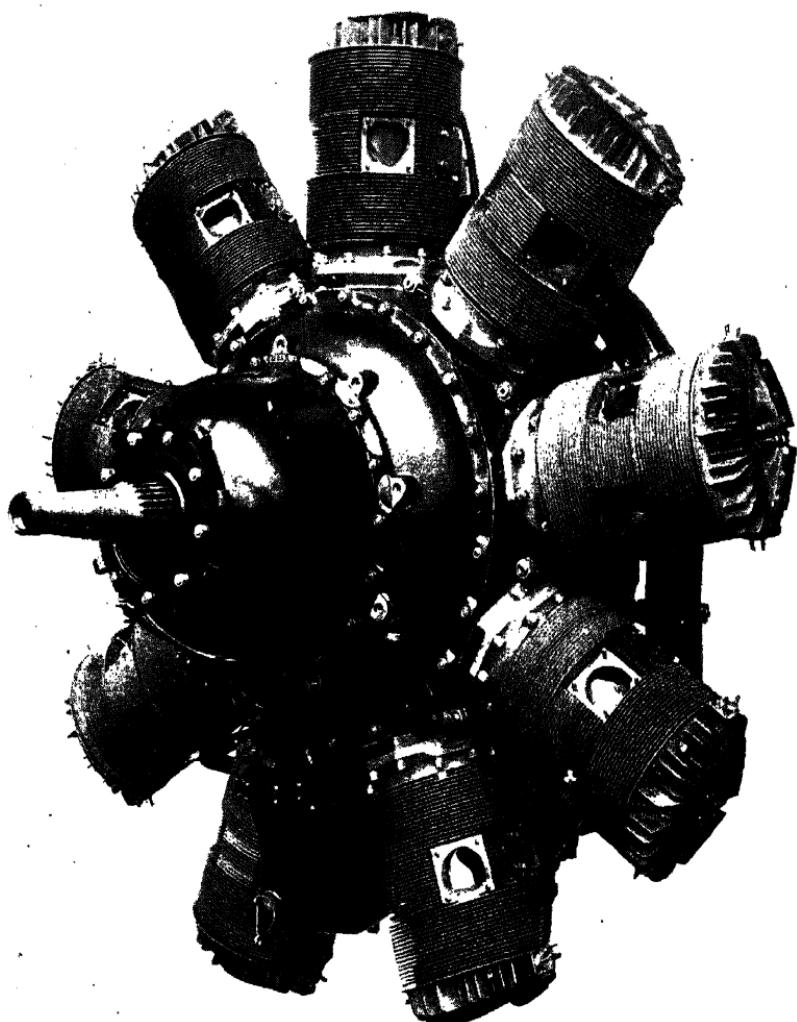
Bristol Pegasus

Bristol Pegasus

Model	Pegasus XVIII (100/130 grade).	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.	
Supercharger	Gear-driven 2-speed supercharger, ratios 6.9:1 and 9.9:1.	
Carburation	1 Hobson AVT-85E 2-barrel updraft carburetor with 3-stage boost control and 2-position automatic mixture control.	
Ignition	2 Rotax SP9.6 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 80 lb./sq.in. (5,6 kg/cm ²). Dry sump.	
Starter	Rotax E-160C or C-1231 electric starter.	
Bore	5.75 in.	146 mm
Stroke	7.50 in.	190 mm
Displacement	1,753 cu.in.	28.7 lit
Compression ratio	6.25:1	6.25:1
Diameter	55.3 in.	1 404 mm
Length	51.0 in.	1 349 mm
Frontal area	16.7 sq.ft.	1,55 m ²
Weight	1,180 lb.	535 kg
Weight/horsepower	1.11 lb./h.p.	0,50 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.61 h.p./cu.in.	36.7 hp/lit
Output/piston area	4.57 h.p./sq.in.	0,71 hp/cm ²
Piston speed (max.)	3,250 ft./min.	16,5 m/sec
B.m.e.p. (max.)	186 lb./sq.in.	13,1 kg/cm ²
Rating (take-off)	1,050 h.p./2,600 r.p.m./43.6 in. (1 109 mm) Hg. boost	
Rating (military, low)	1,065 h.p./2,600 r.p.m./1,250 ft. (400 m)	
Rating (military, high)	965 h.p./2,600 r.p.m./13,000 ft. (4 000 m)	
Rating (normal, low)	815 h.p./2,250 r.p.m./4,750 ft. (1 400 m)	
Rating (normal, high)	750 h.p./2,250 r.p.m./14,750 ft. (4 400 m)	
Rating (cruising, low)	645 h.p./2,250 r.p.m./9,500 ft. (2 900 m)	
Rating (cruising, high)	585 h.p./2,250 r.p.m./20,000 ft. (6 100 m)	

Pegasus XVIII (87-octane): 965 h.p./2,475 r.p.m./take-off; 1,000 h.p./2,600 r.p.m./3,000 ft. (900 m) and 885 h.p./2,600 r.p.m./15,500 ft. (4 700 m) military rating; 815 h.p./2,250 r.p.m./4,750 ft. (1 400 m) and 750 h.p./2,250 r.p.m./14,750 ft. (4 400 m) normal rating. Reduction gear ratio 0.50:1. 2-speed supercharger, ratios 6.9:1 and 9.9:1. 87-octane gasoline.

Additional models of Bristol Pegasus engines will be found on page 191.



Bristol Perseus

Bristol Perseus

Model **Perseus XVI.**

Type 9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder, 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel, 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.

Supercharger Gear-driven 1-speed supercharger, 7.0:1.

Carburation 1 Hobson AVT-95MB updraft carburetor with 2-position mixture control and automatic boost control.

Ignition 2 Rotax SP9-6 magnetos, 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm²). Dry sump.

Starter Rotax E-160C electric starter.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	1,520 cu.in.	24.9 lit
Compression ratio	6.75:1	6,75:1
Diameter	52.0 in.	1 321 mm
Length	60.0 in.	1 524 mm
Frontal area	14.7 sq.ft.	1,38 m ²
Weight	1,140 lb.	517 kg
Weight/horsepower	1.19 lb./h.p.	0,54 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230)	87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.63 h.p./cu.in.	38,3 hp/lit
Output/piston area	4.08 h.p./sq.in.	0,63 hp/cm ²
Piston speed (max.)	2,979 ft./min.	15,1 m/sec
B.m.e.p. (max.)	181 lb./sq.in.	12,7 kg/cm ²

Rating (take-off) 905 h.p./2,750 r.p.m./37.0 in. (940 mm) Hg. boost

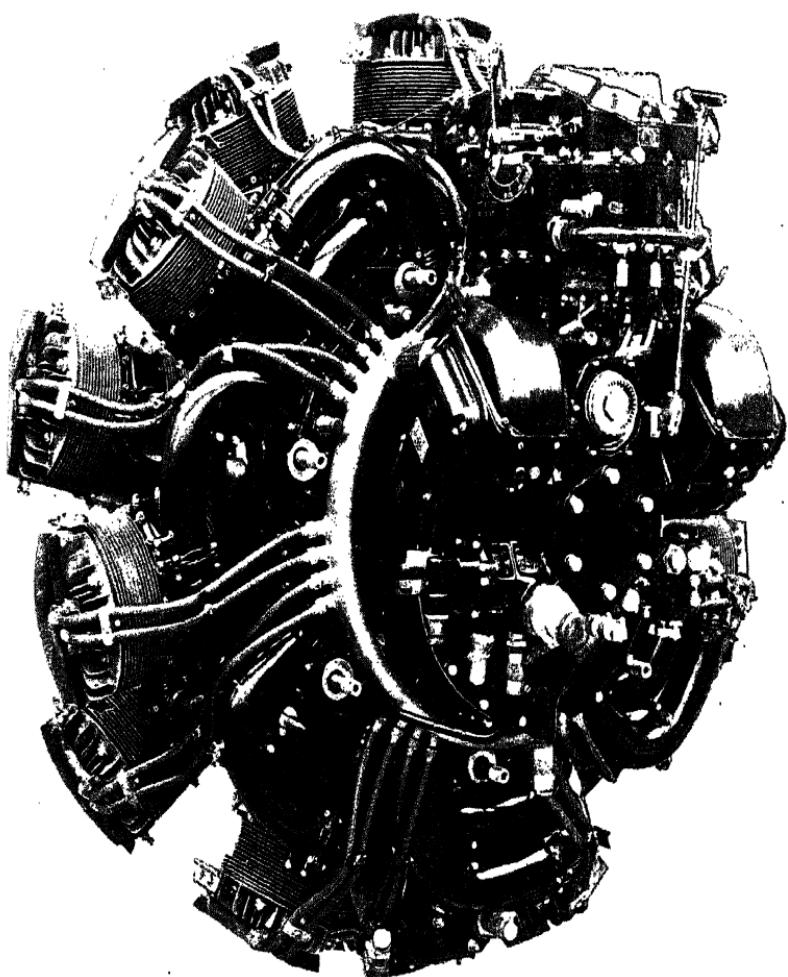
Rating (military) 955 h.p./2,750 r.p.m./5,000 ft. (1 500 m)

Rating (normal) 745 h.p./2,400 r.p.m./6,500 ft. (2 000 m)

Rating (cruising) 560 h.p./2,200 r.p.m./9,000 ft. (2 700 m)

The Bristol Perseus develops 1,175 h.p. at take-off with 100/130 grade gasoline.

Additional models of Bristol Perseus engines will be found on page 191.



Bristol Taurus

Bristol Taurus

Model..... **Taurus XII.**

Type..... 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction..... 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.44:1.

Supercharger..... Gear-driven 1-speed supercharger, ratio 5.6:1.

Carburation..... 1 Hobson AIT-100M downdraft carburetor with automatic mixture control and boost control.

Ignition..... 2 Rotax NST-14, Simms FST-145 or Watford NST-14 magnetos. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication..... Pressure feed, 80 lb./sq.in. (5.6 kg/cm²). Dry sump.

Starter..... Rotax C-1241 electric starter.

Bore	5.00 in.	127 mm
Stroke	5.625 in.	143 mm
Displacement	1,550 cu.in.	25.4 lit
Compression ratio	7.2:1	7.2:1
Diameter	46.2 in.	1 173 mm
Length	58.6 in.	1,488 mm
Frontal area	11.7 sq.ft.	1.09 m ²
Weight	1,335 lb.	605 kg
Weight/horsepower	1.18 lb./h.p.	0.53 kg/hp
Fuel consumption (cr.)	0.43 lb./h.p./hr.	195 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.73 h.p./cu.in.	44.5 hp/lit
Output/piston area	4.11 h.p./sq.in.	0.64 hp/cm ²
Piston speed (max.)	2,906 ft./min.	14.8 m/sec
B.m.e.p. (max.)	187 lb./sq.in.	13.1 kg/cm ²

Rating (take-off)

1,085 h.p./3,100 r.p.m./39.6 in. (1 005 mm) Hg. boost

Rating (military)

1,130 h.p./3,100 r.p.m./3,500 ft. (1 100 m)

Rating (normal)

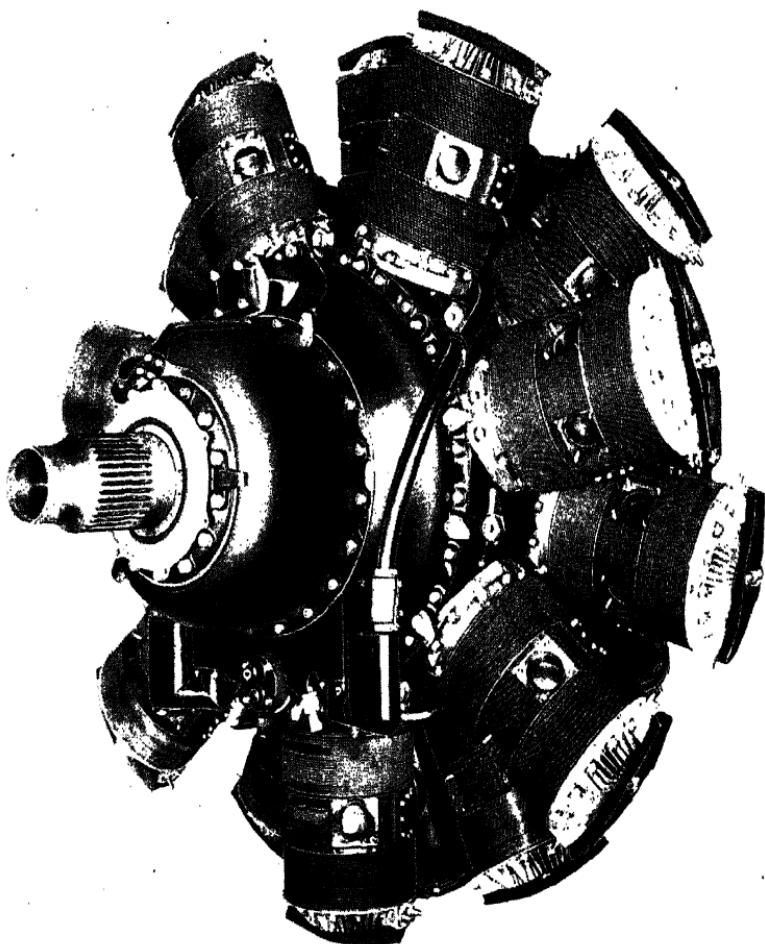
985 h.p./2,800 r.p.m./3,750 ft. (1 100 m)

Rating (max. cruising)

700 h.p./2,500 r.p.m./7,250 ft. (2 200 m)

Taurus XII: Same as Taurus XII.

Taurus VI, XVI: Same as Taurus XII. 1-speed supercharger, ratio 7.5:1.



Bristol Hercules

Bristol Hercules

Model **Hercules XVI.**

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.44:1.

Supercharger Gear-driven 2-speed supercharger, ratios 6.68:1 and 8.35:1.

Carburation 1 Hobson AIT-132M or AIT-132MC 2-barrel downdraft carburetor with automatic mixture control and boost control.

Ignition 2 B.T.H., Rotax or Simms magnetos. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.

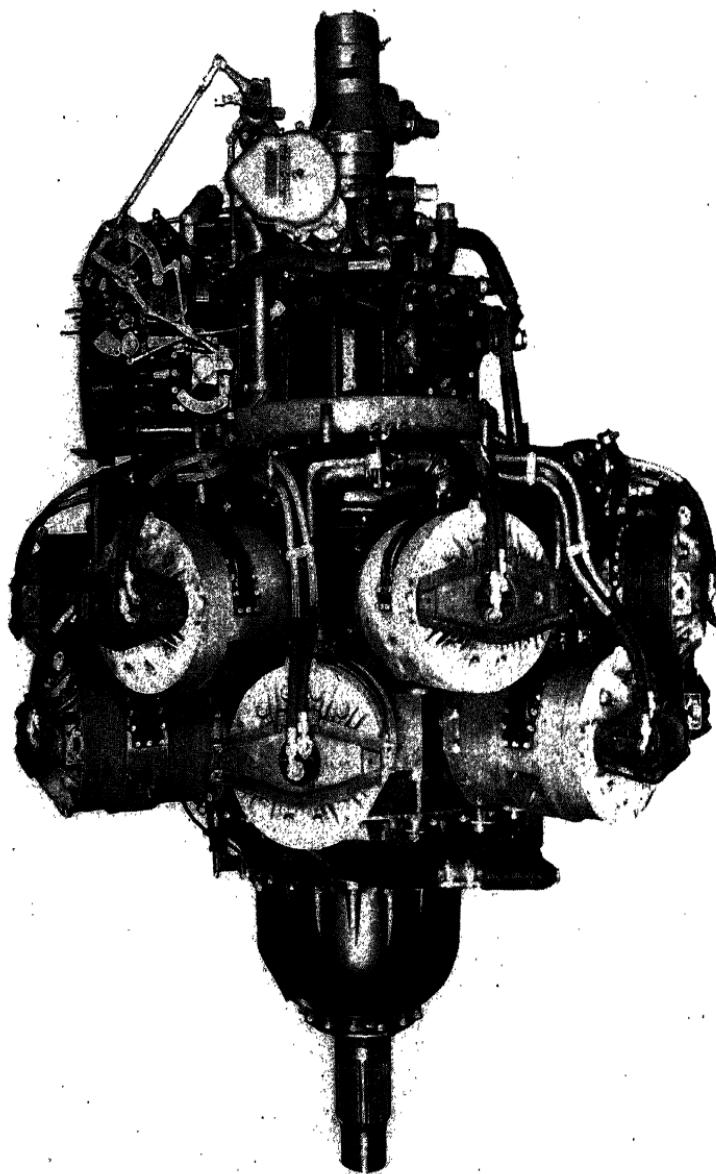
Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm²). Dry sump.

Starter Rotax C-1231 electric starter.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	2,360 cu.in.	38,7 lit
Compression ratio	7.0:1	7,0:1
Diameter	52.0 in.	1 321 mm
Length	70.0 in.	1 778 mm
Frontal area	14.7 sq.ft.	1,37 m ²
Weight	1,890 lb.	857 kg
Weight/horsepower	1.13 lb./h.p.	0.51 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.71 h.p./cu.in.	43,3 hp/lit
Output/piston area	4.60 h.p./sq.in.	0.71 hp/cm ²
Piston speed (max.)	3,182 ft./min.	15,9 m/sec
B.m.e.p. (max.)	194 lb./sq.in.	13,6 kg/cm ²
Rating (take-off)	1,615 h.p./2,900 r.p.m./46.7 in. (1 186 mm)	Hg. boost
Rating (military, low)	1,675 h.p./2,900 r.p.m./4,500 ft. (1 400 m)	
Rating (military, high)	1,455 h.p./2,900 r.p.m./12,000 ft. (3 700 m)	
Rating (normal, low)	1,355 h.p./2,400 r.p.m./4,750 ft. (1 400 m)	
Rating (normal, high)	1,240 h.p./2,400 r.p.m./12,000 ft. (3 700 m)	
Rating (cruising, low)	1,050 h.p./2,400 r.p.m./10,250 ft. (3 100 m)	
Rating (cruising, high)	955 h.p./2,400 r.p.m./17,250 ft. (5 300 m)	

Hercules VI: Same as Hercules XVI.

Additional models of Bristol Hercules engines will be found on page 191.



Pratt & Whitney
Hercules

Additional Models of Bristol Mercury Engines

(Continued from page 181)

Mercury XX: 820 h.p./2,650 r.p.m./take-off; 870 h.p./2,750 r.p.m./4,500 ft. (1 400 m) military rating; 810 h.p./2,400 r.p.m./2,500 ft. (800 m) normal rating. Reduction gear ratio 0.572:1. 1-speed supercharger, ratio 9.4:1. 87-octane gasoline.

Mercury 30: 950 h.p./2,750 r.p.m./take-off; 995 h.p./2,750 r.p.m./18,000 ft. (5 500 m) military rating. Reduction gear ratio 0.57:1. 1-speed supercharger, ratio 9.4:1. 100/130 grade gasoline.

Additional Models of Bristol Pegasus Engines

(Continued from page 183)

Pegasus VI: 815 h.p./2,425 r.p.m./take-off; 840 h.p./2,525 r.p.m./1,250 ft. (400 m) military rating; 690 h.p./2,200 r.p.m./3,500 ft. (1 100 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 7.0:1. 87-octane gasoline. Equipped for pusher propeller.

Pegasus 22, 23: 1,010 h.p./2,600 r.p.m./take-off; 865 h.p./2,600 r.p.m./6,500 ft. (2 000 m) military rating; 825 h.p./2,250 r.p.m./4,000 ft. (1 200 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, 7.0:1. 87-octane gasoline.

Additional Models of Bristol Perseus Engines

(Continued from page 185)

Perseus Xa: 930 h.p./2,750 r.p.m./take-off; 935 h.p./2,650 r.p.m./5,500 ft. (1 700 m) military rating; 860 h.p./2,400 r.p.m./2,750 ft. (800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.8:1. 87-octane gasoline.

Perseus XI, XII: 830 h.p./2,650 r.p.m./take-off; 905 h.p./2,750 r.p.m./6,500 ft. (2 000 m) military rating; 745 h.p./2,400 r.p.m./6,500 ft. (2 000 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, 7.0:1. 87-octane gasoline.

Perseus XIIc, XIVc: 830 h.p./2,700 r.p.m./take-off; 815 h.p./2,600 r.p.m./6,000 ft. (1 800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.0:1. 87-octane gasoline.

Additional Models of Bristol Hercules Engines

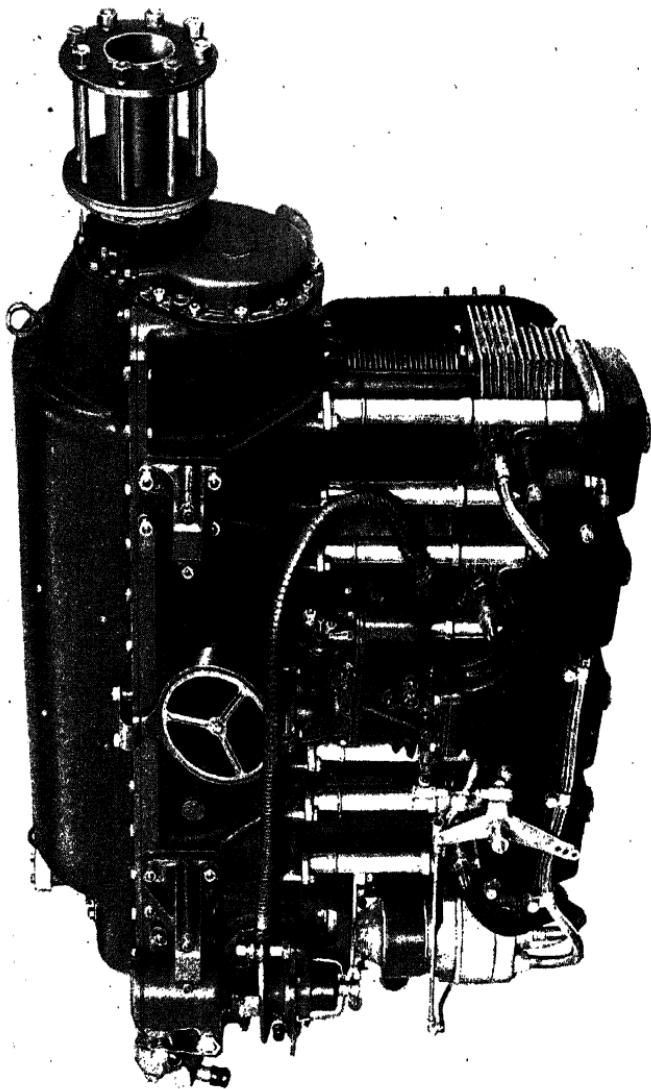
(Continued from page 189)

Hercules VII: Same as Hercules XVII.

Hercules XI: 1,560 h.p./2,800 r.p.m./take-off; 1,560 h.p./2,800 r.p.m./sea level and 1,460 h.p./2,800 r.p.m./9,500 ft. (2 900 m) military rating; 1,310 h.p./2,500 r.p.m./2,000 ft. (600 m) and 1,185 h.p./2,500 r.p.m./12,750 ft. (3 900 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger, ratios 5.37:1 and 7.56:1. 100/130 grade gasoline.

Hercules XVII: 1,725 h.p./2,900 r.p.m./take-off; 1,735 h.p./2,900 r.p.m./500 ft. (150 m) military rating; 1,395 h.p./2,400 r.p.m./1,500 ft. (500 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger, ratios 6.68:1 and 8.35:1, with high gear sealed out of operation. 100/130 grade gasoline.

Hercules XVIII: 1,725 h.p./2,900 r.p.m./take-off; 1,735 h.p./2,900 r.p.m./500 ft. (150 m) and 1,565 h.p./2,900 r.p.m./8,000 ft. (2 400 m) military rating; 1,395 h.p./2,400 r.p.m./1,500 ft. (500 m) and 1,300 h.p./2,400 r.p.m./8,250 ft. (2 500 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger, ratios 6.68:1 and 8.35:1. 100/130 grade gasoline.



Cirrus or Series

Cirrus Minor (Series II)Model **Cirrus Minor I.**

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Hobson AI40 downdraft carburetor with altitude control. Amal flame trap.

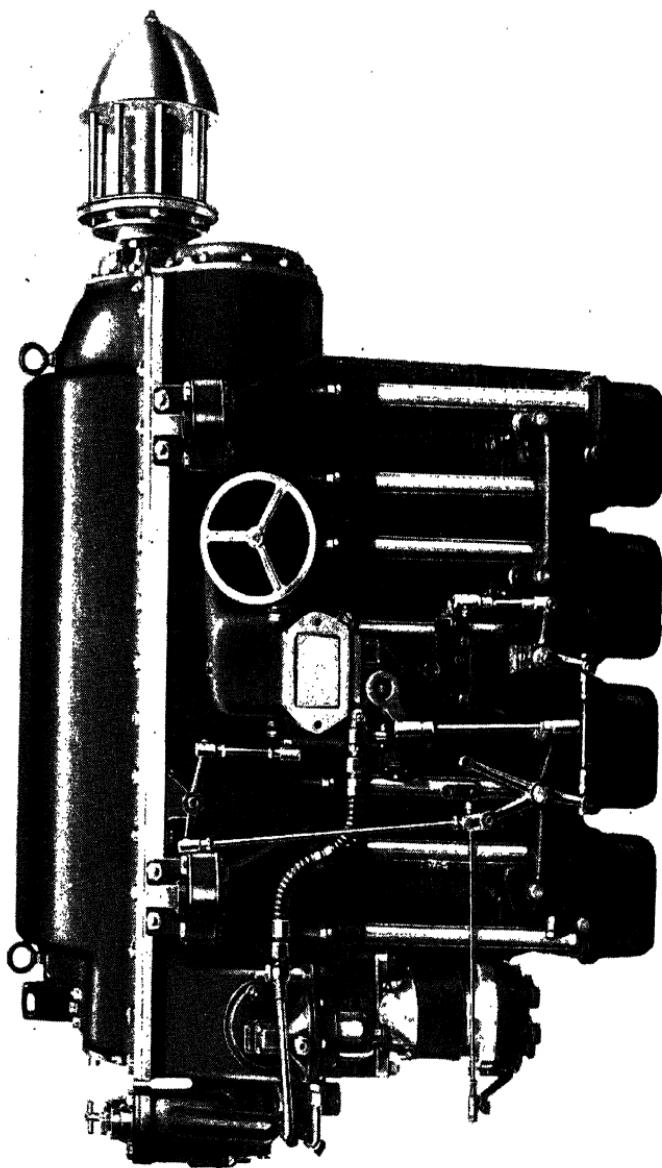
Ignition 2 B.T.H. SG4-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 23-35 lb./sq.in. (1,6-2,5 kg/cm²). Dry sump.

Starter B.T.H. electric starter.

Bore	3.75 in.	95 mm
Stroke	5.00 in.	127 mm
Displacement	220 cu.in.	3,6 lit
Compression ratio	5.8:1	5,8:1
Width	17.3 in.	440 mm
Height	25.0 in.	635 mm
Length	37.8 in.	960 mm
Frontal area	2.7 sq.ft.	0,25 m ²
Weight	208 lb.	94 kg
Weight/horsepower	2.31 lb./h.p.	1,05 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	245 g/hp/hr
Oil consumption (cr.)	0.017 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	73 octane (RDE/F/73 OS)	73 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.41 h.p./cu.in.	25,0 hp/lit
Output/piston area	2.04 h.p./sq.in.	0,32 hp/cm ²
Piston speed (max.)	2,167 ft./min.	11,0 m/sec
B.m.e.p. (max.)	125 lb./sq.in.	8,8 kg/cm ²
Rating (take-off)	90 h.p./2,600 r.p.m.	
Rating (normal)	82 h.p./2,300 r.p.m./sea level	
Rating (cruising)	78 h.p./2,200 r.p.m./sea level	

Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



Pratt & Whitney R-1830 Series

Cirrus Minor (Series III)

Model **Cirrus Minor II.**

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 2-piece elektron crankcase divided horizontally. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Zenith downdraft carburetor. Amal flame trap.

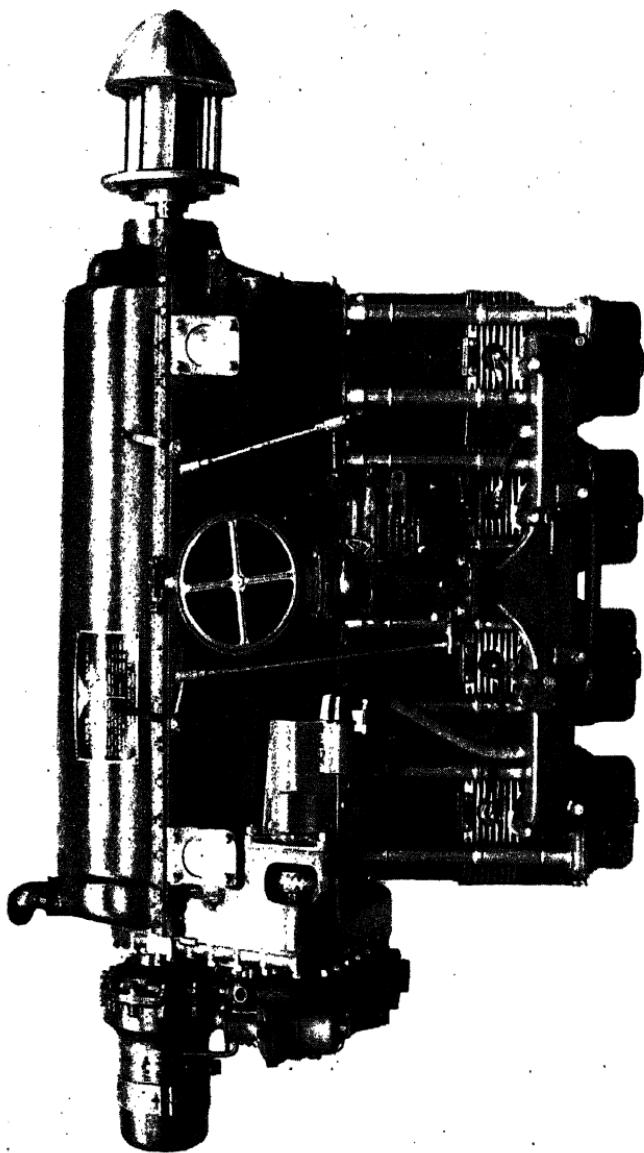
Ignition 2 B.T.H. SG4-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system optional.

Lubrication Pressure feed, 23-35 lb./sq.in. (1,6 - 2,5 kg/cm²). Dry sump.

Starter Optional. B.T.H. electric starter can be used.

Bore	3.94 in.	100 mm
Stroke	5.00 in.	127 mm
Displacement	243 cu.in.	4,0 lit
Compression ratio	6.25:1	6,25:1
Width	17.9 in.	455 mm
Height	25.6 in.	650 mm
Length	38.0 in.	965 mm
Frontal area	2.9 sq.ft.	0,27 m ²
Weight	248 lb.	112 kg
Weight/horsepower	2.48 lb./h.p.	1,12 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.017 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	73 octane (RDE/F/73 OS)	73 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.41 h.p./cu.in.	25,0 hp/lit
Output/piston area	2.04 h.p./sq.in.	0,32 hp/cm ²
Piston speed (max.)	2,167 ft./min.	11,0 m/sec
B.m.e.p. (max.)	125 lb./sq.in.	8,8 kg/cm ²
Rating (take-off)	100 h.p./2,600 r.p.m.	
Rating (normal)	90 h.p./2,300 r.p.m./sea level	
Rating (cruising)	80 h.p./2,200 r.p.m./sea level	

Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



Cirrus Major

Cirrus MajorModel **Cirrus Major I.**

Type 4 cylinders, inverted in-line, air-cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Hobson AI48G downdraft carburetor with altitude control.

Ignition 2 Simms FTD-4U magnetos. 2 14-mm short reach spark plugs per cylinder.

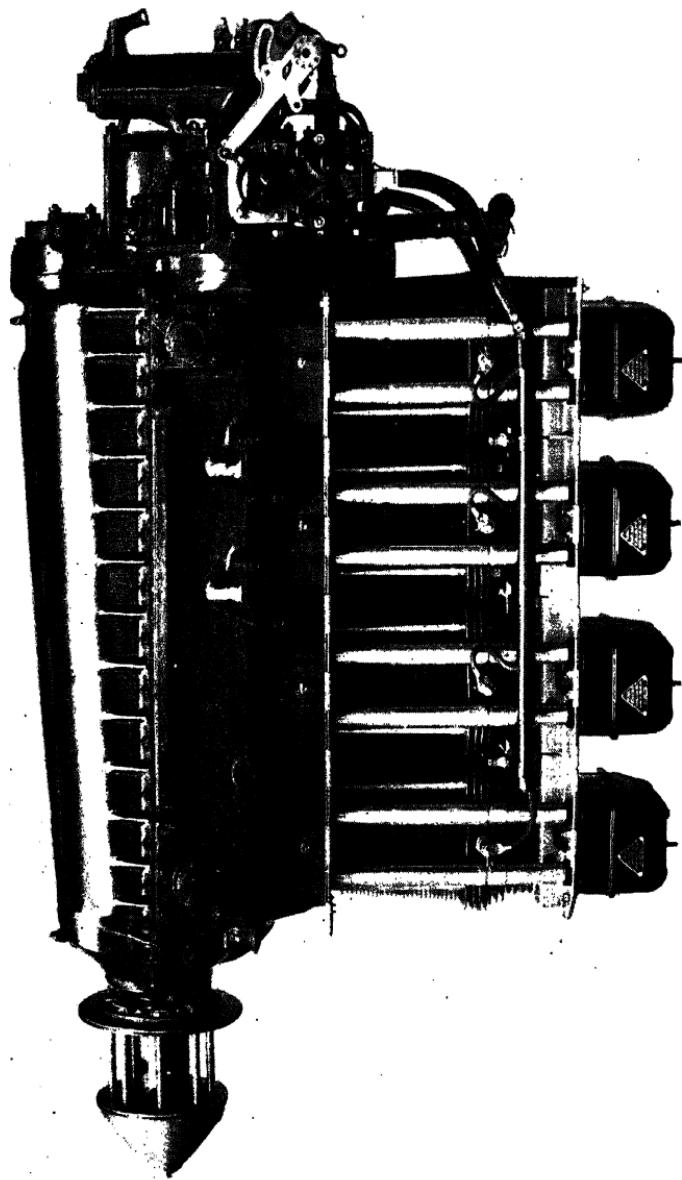
Lubrication Pressure feed, 30-40 lb./sq.in. (2,1-2,8 kg/cm²). Dry sump.

Starter B.T.H. electric starter.

Bore	4.72 in.	120 mm
Stroke	5.50 in.	140 mm
Displacement	386 cu.in.	6,3 lit
Compression ratio	5.8:1	5,8:1
Width	17.0 in.	433 mm
Height	30.0 in.	761 mm
Length	42.9 in.	1 090 mm
Frontal area	4.2 sq.ft.	0,39 m ²
Weight	325 lb.	147 kg
Weight/horsepower	2.17 lb./h.p.	0,98 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	245 g/hp/hr
Oil consumption (cr.)	0.010 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	73 octane (RDE/F/73 OS)	73 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.39 h.p./cu.in.	23,8 hp/lit
Output/piston area	2.14 h.p./sq.in.	0,33 hp/cm ²
Piston speed (max.)	2,246 ft./min.	11,4 m/sec
B.m.e.p. (max.)	126 lb./sq.in.	8,9 kg/cm ²
Rating (take-off)	150 h.p./2,450 r.p.m.	
Rating (normal)	138 h.p./2,200 r.p.m./sea level	
Rating (cruising)	134 h.p./2,100 r.p.m./sea level	

Cirrus Major II: Same as Cirrus Major I. Weighs 338 lb. (153 kg.)

Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



De Havilland Gipsy Major

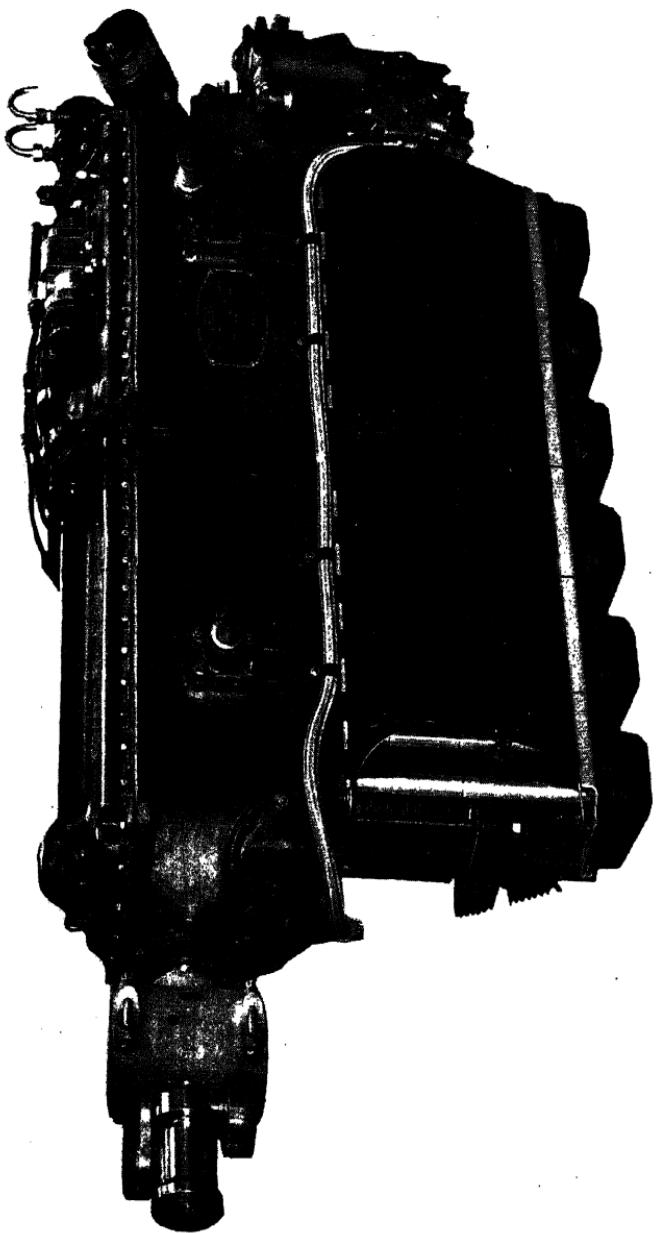
De Havilland Gipsy Major

Model	Gipsy Major I.	
Type	4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.	
Construction	2-piece magnesium alloy crankcase. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crank-shaft supported in 5 plain bearings. Equipped for fixed pitch propeller.	
Supercharger	None.	
Carburation	1 Hobson AI48 downdraft carburetor with manual mixture control.	
Ignition	2 B.T.H. AG4-4 magnetos. 2 12-mm short reach spark plugs per cylinder.	
Lubrication	Pressure feed, 40-45 lb./sq.in. (2,8 - 3,2 kg/cm ²). Dry sump.	
Starter	None.	
Bore	4.65 in.	118 mm
Stroke	5.51 in.	140 mm
Displacement	374 cu.in.	6,1 lit
Compression ratio	5.25:1	5,25:1
Width	20.0 in.	508 mm
Height	29.6 in.	752 mm
Length	48.3 in.	1 227 mm
Frontal area	3.8 sq.ft.	0,35 m ²
Weight	305 lb.	138 kg
Weight/horsepower	2.35 lb./h.p.	1,06 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.35 h.p./cu.in.	21,3 hp/lit
Output/piston area	1.91 h.p./sq.in.	0,30 hp/cm ²
Piston speed (max.)	2,154 ft./min.	11,0 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	8,3 kg/cm ²
Rating (take-off)	130 h.p./2,350 r.p.m.	
Rating (normal)	120 h.p./2,100 r.p.m./sea level	
Rating (cruising)	85 h.p./2,000 r.p.m./sea level	

Gipsy Major IC: 140 h.p./2,400 r.p.m./take-off; 130 h.p./2,100 r.p.m./sea level normal rating. Direct drive. Not supercharged. 80-octane gasoline. Equipped for fixed pitch propeller.

Gipsy Major II: Same as Gipsy Major IC. Equipped for variable pitch propeller. Uses 14-mm short reach spark plugs.

Gipsy Major III: 160 h.p./2,500 r.p.m./take-off; 156 h.p./2,400 r.p.m./sea level normal rating. Direct drive. Not supercharged. 80-octane gasoline.



De Havilland Gipsy Six

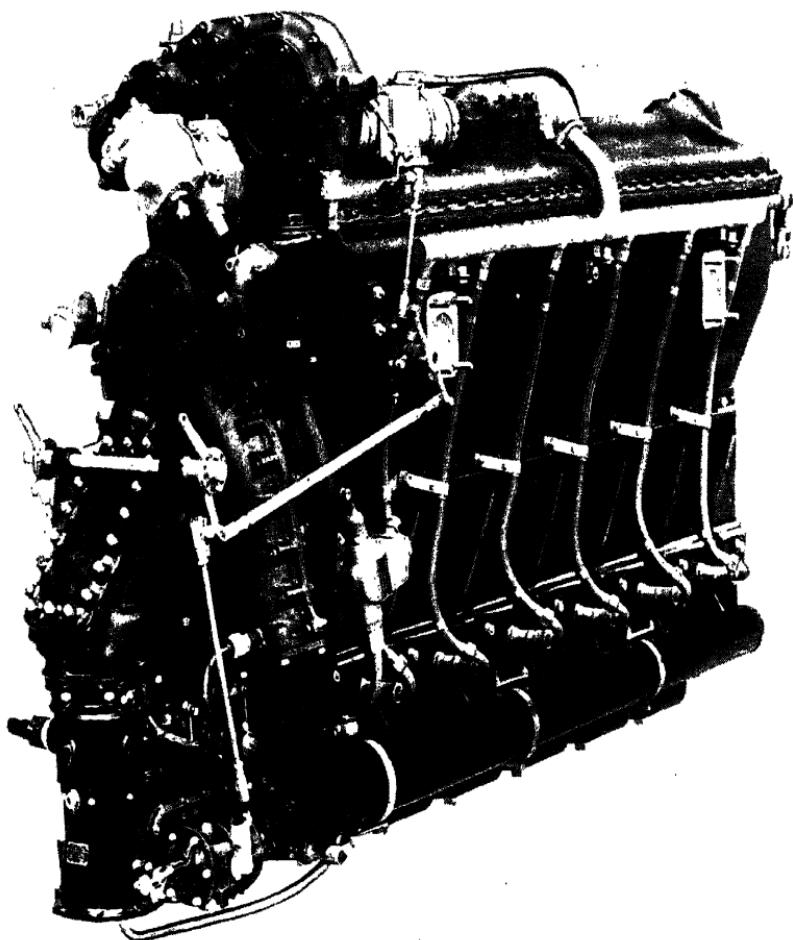
De Havilland Gipsy Six II

Model	Gipsy Six II (Gipsyqueen II).	
Type	6-cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.	
Construction	1-piece magnesium alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 7 plain bearings. Equipped for variable pitch propeller.	
Supercharger	None.	
Carburation	2 Hobson AI48F downdraft carburetors with automatic mixture control.	
Ignition	2 B.T.H. MCL-1 magnetos. 2 14-mm short reach spark plugs per cylinder.	
Lubrication	Pressure feed. 40-45 lb./sq.in. (2,8-3,2 kg/cm ²). Dry sump.	
Starter	Rotax N3EY hand or electric starter.	
Bore	4.65 in.	118 mm
Stroke	5.50 in.	140 mm
Displacement	558 cu.in.	9,1 lit
Compression ratio	6.0:1	6,0:1
Width	19.1 in.	485 mm
Height	31.7 in.	805 mm
Length	63.5 in.	1 613 mm
Frontal area	3.8 sq.ft.	0,35 m ²
Weight	503 lb.	228 kg
Weight/horsepower	2,40 lb./h.p.	1,09 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.024 lb./h.p./hr.	11 g/hp/hr
Gasoline grade	80 octane (D.T.D. 224)	80 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.38 h.p./cu.in.	22,8 hp/lit
Output/piston area	2,06 h.p./sq.in.	0,32 hp/cm ²
Piston speed (max.)	2,200 ft./min.	11,2 m/sec
B.m.e.p. (max.)	125 lb./sq.in.	8,8 kg/cm ²
Rating (take-off)	210 h.p./2,400 r.p.m.	
Rating (normal)	185 h.p./2,100 r.p.m./sea level	
Rating (cruising)	145 h.p./2,100 r.p.m./sea level	

Gipsy Six I (Gipsyqueen III): 200 h.p./2,350 r.p.m./take-off; 185 h.p./2,100 r.p.m./sea level normal rating. Direct drive. Not supercharged. 73-octane gasoline. Equipped for fixed pitch propeller.

Gipsy Six II (Gipsyqueen I): Same as Gipsy Six II (Gipsyqueen II). Equipped for fixed pitch propeller.

These engines are known by the name *Gipsyqueen* when used in Royal Air Force aircraft.



De Havilland Gipsy Six IIIS

De Havilland Gipsy Six IIIS

Model Gipsy Six IIIS (Gipsyqueen IV).

Type 6 cylinders, inverted in-line, air cooled, direct drive, supercharged, 4-cycle.

Construction 1-piece magnesium alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Equipped for constant speed propeller.

Supercharger Gear-driven 1-speed supercharger, ratio 11.16:1.

Carburation 1 Hobson AV70M updraft carburetor with automatic boost control and mixture control.

Ignition 2 B.T.H. MC1-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45 lb./sq.in. (3,2 kg/cm²). Dry sump.

Starter Rotax N3EY hand or electric starter.

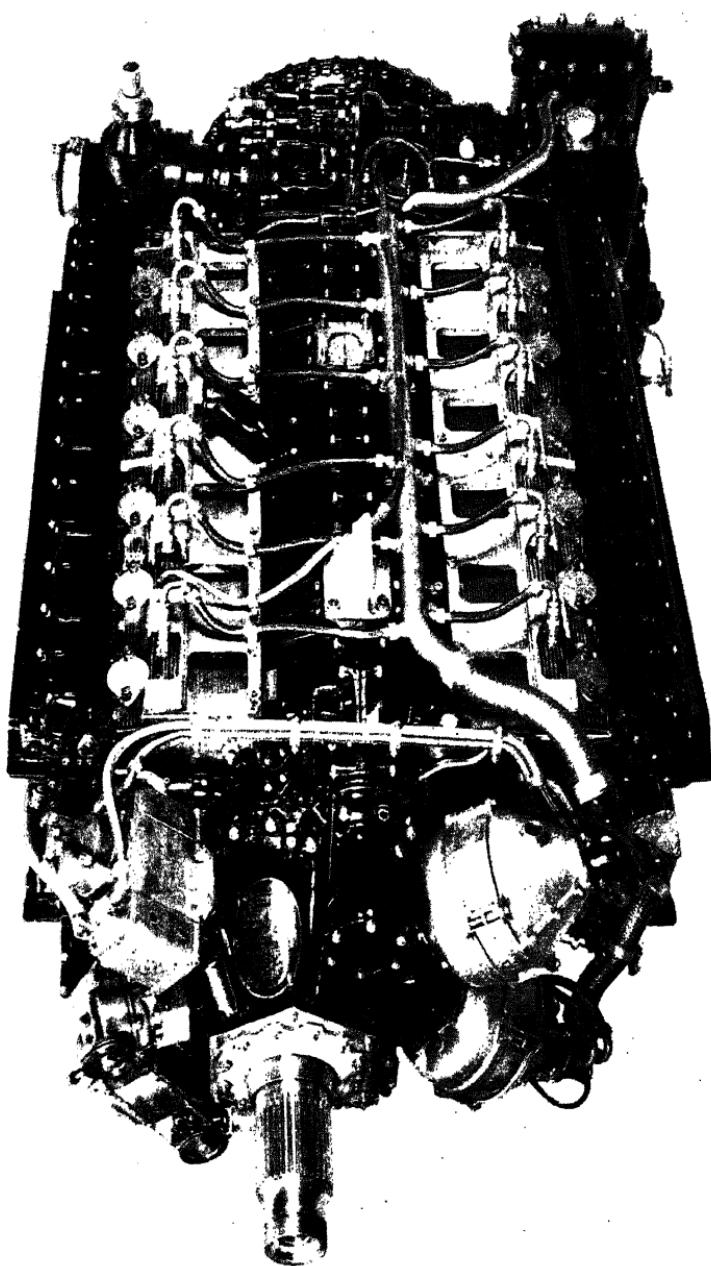
Bore	4.72 in.	120 mm
Stroke	5.90 in.	150 mm
Displacement	622 cu.in.	10,2 lit
Compression ratio	6.2:1	6,2:1
Width	16.5 in.	419 mm
Height	33.7 in.	856 mm
Length	64.5 in.	1 639 mm
Frontal area	3.5 sq.ft.	0,32 m ²
Weight	560 lb.	254 kg
Weight/horsepower	1.96 lb./h.p.	0,89 kg/hp
Fuel consumption (cr.)	0.62 lb./h.p./hr.	280 g/hp/hr
Oil consumption (cr.)	0.026 lb./h.p./hr.	12 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230)	87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.46 h.p./cu.in.	28,0 hp/lit
Output/piston area	2.71 h.p./sq.in.	0,42 hp/cm ²
Piston speed (max.)	2,458 ft./min.	12,5 m/sec
B.m.e.p. (max.)	146 lb./sq.in.	10,3 kg/cm ²

Rating (take-off) 285 h.p./2,500 r.p.m./40.0 in. (1 016 mm) Hg. boost

Rating (normal) 265 h.p./2,400 r.p.m./7,000 ft. (2 100 m)

Rating (cruising) 230 h.p./2,100 r.p.m./5,500 ft. (1 700 m)

This engine is known by the name *Gipsyqueen* when used in Royal Air Force aircraft.



Napier Dagger

Napier Dagger

Model **Dagger VIII.**

Type 24 cylinders, vertical H with 4 banks, air cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 2 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.31:1.

Supercharger Gear-driven 1-speed supercharger, ratio 5.07:1. Double-entry impeller.

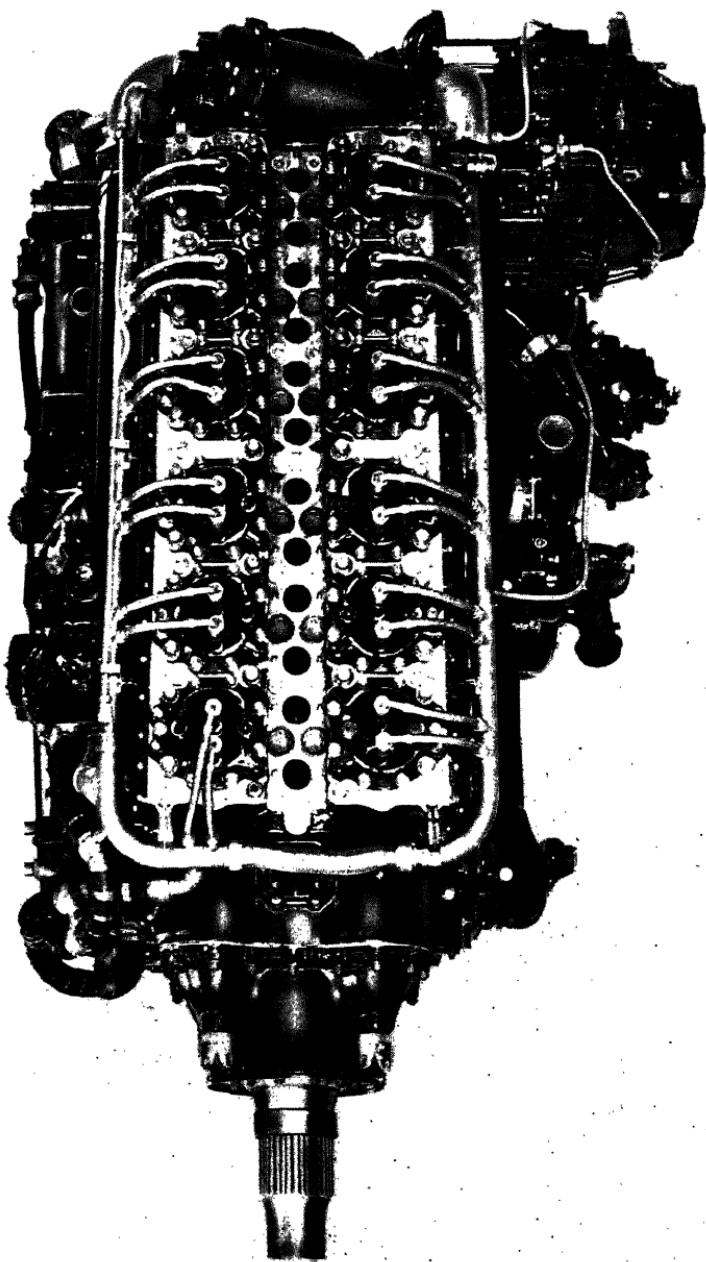
Carburation 1 S.U. AVT-30N1 2-barrel updraft carburetor with 2-position mixture control and automatic boost control.

Ignition 2 B.T.H. CSE12-12S magnetos and 2 B.T.H. 24-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 50 lb./sq.in. (3,5 kg/cm²). Dry sump.

Starter Rotax 12VE-160C electric starter.

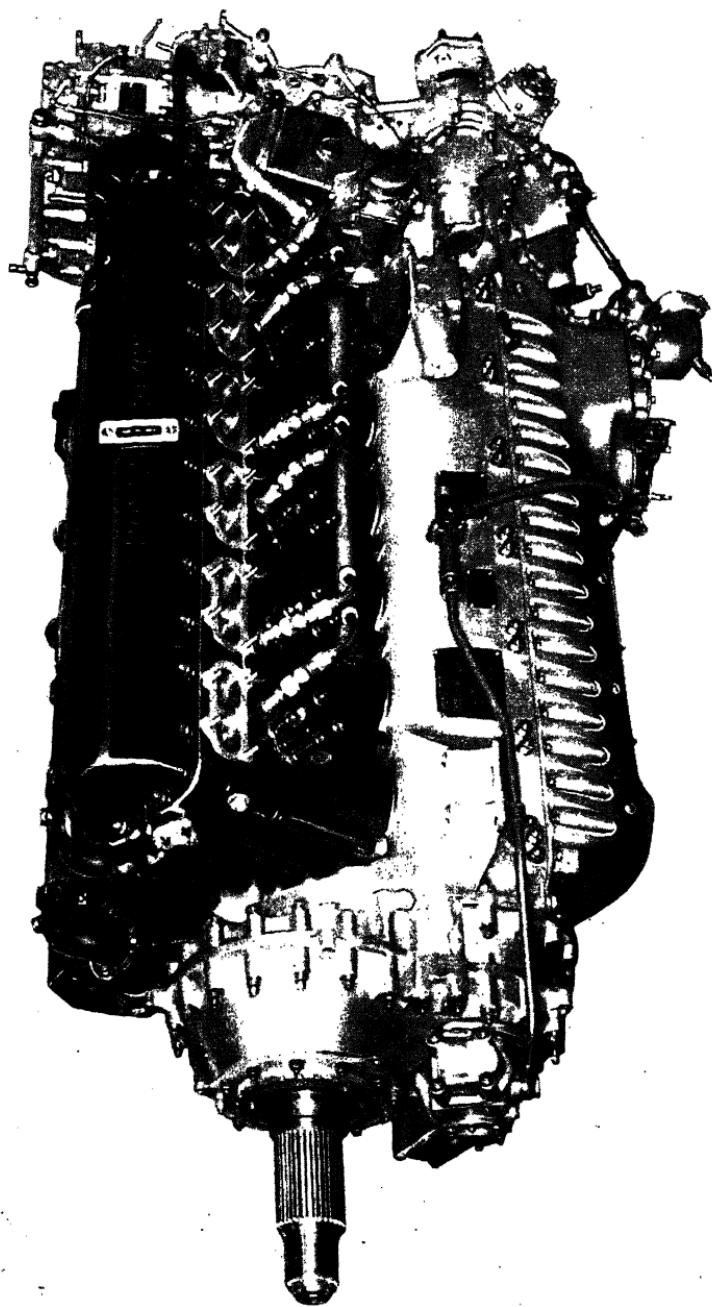
Bore	3.8125 in.	97 mm
Stroke	3.75 in.	95 mm
Displacement	1,027 cu.in.	16,8 lit
Compression ratio	7.5:1	7,5:1
Width	23.0 in.	584 mm
Height	45.0 in.	1 143 mm
Length	80.0 in.	2 032 mm
Frontal area	5.3 sq.ft.	0,49 m ²
Weight	1,390 lb.	630 kg
Weight/horsepower	1.39 lb./h.p.	0,63 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.012 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	87 octane (D.T.D. 230)	87 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.97 h.p./cu.in.	59,5 hp/lit
Output/piston area	4.18 h.p./sq.in.	0,65 hp/cm ²
Piston speed (max.)	2,625 ft./min.	13,3 m/sec
B.m.e.p. (max.)	183 lb./sq.in.	12,9 kg/cm ²
Rating (take-off)	955 h.p./4,200 r.p.m./42.1 in. (1 070 mm) Hg. boost	
Rating (military)	1,000 h.p./4,200 r.p.m./8,750 ft. (2 700 m)	
Rating (normal)	920 h.p./4,000 r.p.m./9,000 ft. (2 700 m)	
Rating (cruising)	620 h.p./3,500 r.p.m./12,250 ft. (3 700 m)	



Pratt & Whitney
Sabre

Napier Sabre

Model	Sabre IIA.	
Type	24 cylinders, horizontal H with 4 banks, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided vertically. 2 interchangeable aluminum alloy cylinder blocks each containing 6 upper and 6 lower cylinder bores. Steel cylinder liners. Cylinder blocks attached horizontally to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable cylinder heads. 1 4-port reciprocating single-sleeve valve per cylinder, 3 inlet ports and 2 exhaust ports per cylinder. 2 6-throw 1-piece crankshafts supported in 7 plain bearings. Compound helical reduction gear, ratio 0.274:1. Equipped for De Havilland Hydromatic propeller.	
Supercharger	Gear-driven 2-speed supercharger, ratios 4.48:1 and 6.26:1. Double entry impeller. Automatic boost control.	
Carburation	1 S.U. AVQ-30/200 4-barrel updraft carburetor with automatic mixture control and altitude control.	
Ignition	2 B.T.H. C1SE-ES duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60-90 lb./sq.in. (4,2 - 6,3 kg/cm ²). Dry sump.	
Starter	Plessy Coffman L-4S combustion type starter with 5-cartridge magazine.	
Bore	5.00 in.	127 mm
Stroke	4.75 in.	120 mm
Displacement	2,240 cu.in.	36,7 lit
Compression ratio	7.0:1	7,0:1
Width	40.0 in.	1 016 mm
Height	51.1 in.	1 297 mm
Length	81.1 in.	2 059 mm
Frontal area	10.0 sq.ft.	0,93 m ²
Weight	2,360 lb.	1 070 kg
Weight/horsepower	1.07 lb./h.p.	0,48 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.98 h.p./cu.in.	60,0 hp/lit
Output/piston area	4.67 h.p./sq.in.	0,72 hp/cm ²
Piston speed (max.)	2,929 ft./min.	14,8 m/sec
B.m.e.p. (max.)	210 lb./sq.in.	14,7 kg/cm ²
Rating (take-off)	2,200 h.p./3,700 r.p.m.	
Sabre IIB:	2,400 h.p./take-off. All other data restricted, January, 1945.	



Ro Royce rine

Rolls-Royce Peregrine

Model Peregrine I.

Type 12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Spur reduction gear, ratio 0.47:1.

Supercharger Gear-driven 1-speed supercharger, ratio 9.5:1.

Carburation 1 S.U. AIT-32 downdraft carburetor with 2-position automatic mixture control and progressive boost control.

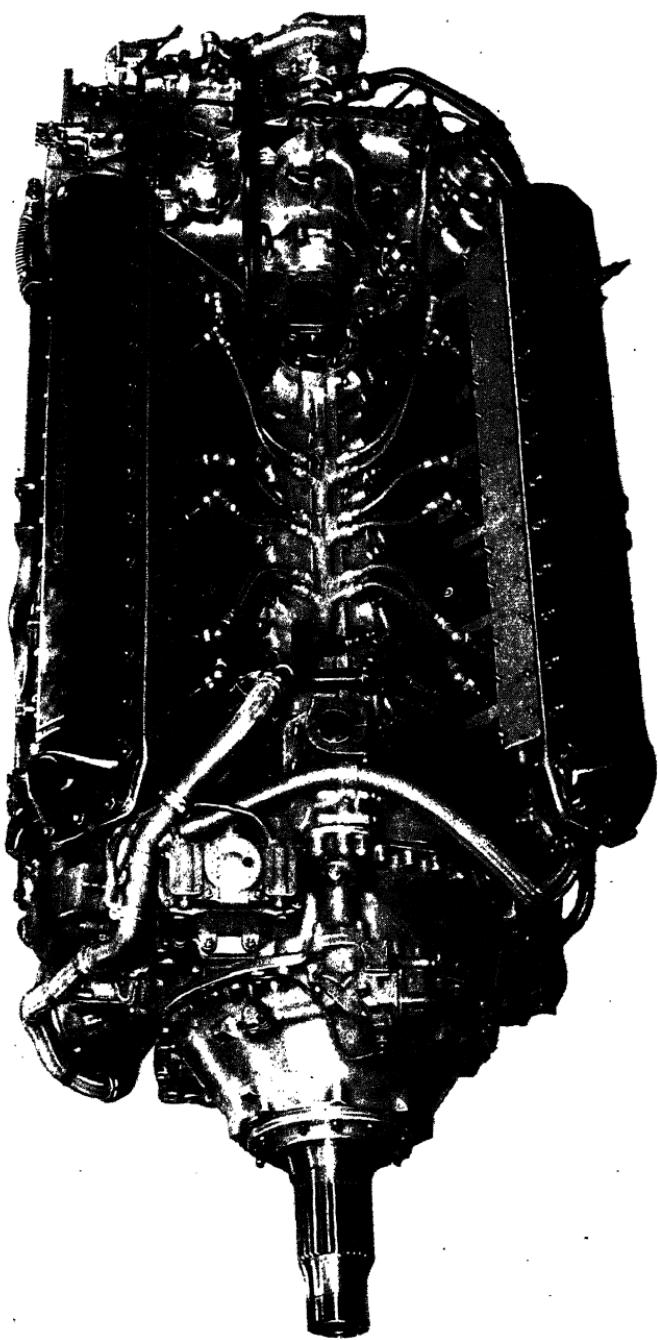
Ignition 2 B.T.H. C5SE-12S magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump.

Starter Rotax N3ET electric starter.

Bore	5.00 in.	127 mm
Stroke	5.50 in.	140 mm
Displacement	1,296 cu.in.	21,2 lit
Compression ratio	6.0:1	6,0:1
Width	27.1 in.	688 mm
Height	39.9 in.	1 012 mm
Length	73.6 in.	1 870 mm
Frontal area	5.0 sq.ft.	0,46 m ²
Weight	1,106 lb.	502 kg
Weight/horsepower	1.15 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.74 h.p./cu.in.	45,3 hp/lit
Output/piston area	4.07 h.p./sq.in.	0,63 hp/cm ²
Piston speed (max.)	2,750 ft./min.	14,0 m/sec
B.m.e.p. (max.)	185 lb./sq.in.	13,0 kg/cm ²
Rating (take-off)	765 h.p./3,000 r.p.m./43.7 in. (1 109 mm)	Hg. boost
Rating (military)	960 h.p./3,000 r.p.m./12,000 ft. (3 700 m)	
Rating (normal)	860 h.p./2,850 r.p.m./13,500 ft. (4 100 m)	
Rating (max. cruising)	730 h.p./2,600 r.p.m./13,500 ft. (4 100 m)	

Peregrine II: Same as Peregrine I. Propeller rotates in opposite direction.



Ro. Royce Vulture

Rolls-Royce Vulture

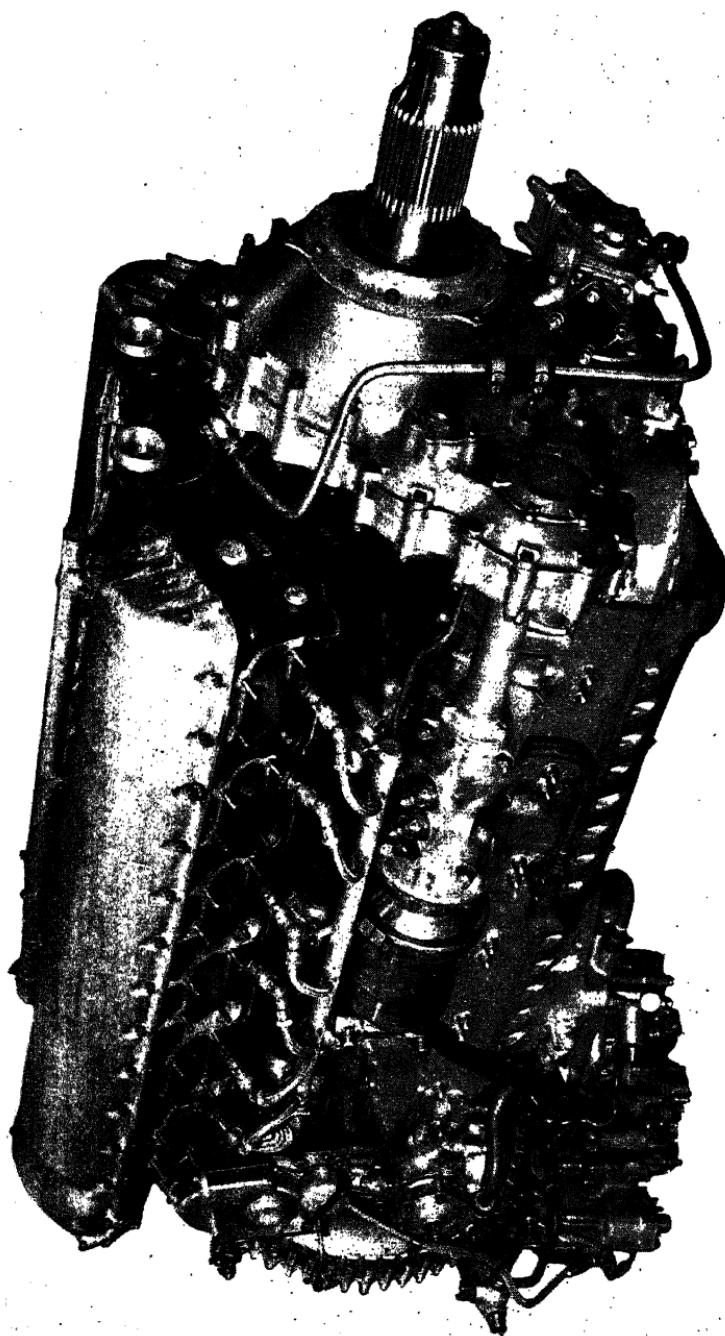
Model Vulture I.

Type	24 cylinders, X 90 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase, 4 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners, 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 12-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Spur reduction gear, ratio 0.35:1.
Supercharger	Gear-driven 2-speed supercharger, ratios 5.46:1 and 7.28:1. 2 intake manifolds each supplying 2 blocks of cylinders.
Carburation	1 S.U. AIT-48 2-barrel downdraft carburetor with 2-position automatic mixture control and progressive boost control.
Ignition	2 Rotax NG2-1 magnetos and 2 Rotax ND24-1 24-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 70 lb./sq.in. (4.9 kg/cm ²). Dry sump.
Starter	Rotax C-1501 electric starter.
Bore	5.00 in. 127 mm
Stroke	5.50 in. 140 mm
Displacement	2,592 cu.in. 42.4 lit
Compression ratio	6.0:1 6.0:1
Width	35.8 in. 909 mm
Height	42.3 in. 1,075 mm
Length	78.0 in. 1,981 mm
Frontal area	8.0 sq.ft. 0.74 m ²
Weight	2,450 lb. 1,111 kg
Weight/horsepower	1.21 lb./h.p. 0.55 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr. 220 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr. 10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475) 100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B) 20.5 cs
Output/displacement	0.77 h.p./cu.in. 47.4 hp/lit
Output/piston area	4.27 h.p./sq.in. 0.66 hp/cm ²
Piston speed (max.)	2,750 ft./min. 14.0 m/sec
B.m.e.p. (max.)	203 lb./sq.in. 14.3 kg/cm ²
Rating (take-off)	2,010 h.p./3,000 r.p.m./48.2 in. (1,224 mm) Hg. boost
Rating (military, low)	1,845 h.p./3,000 r.p.m./5,000 ft. (1,500 m)
Rating (military, high)	1,710 h.p./3,000 r.p.m./15,000 ft. (4,600 m)
Rating (normal, low)	1,780 h.p./2,850 r.p.m./4,000 ft. (1,200 m)
Rating (normal, high)	1,660 h.p./2,850 r.p.m./13,500 ft. (4,100 m)
Rating (cruising, low)	1,475 h.p./2,600 r.p.m./5,500 ft. (1,700 m)
Rating (cruising, high)	1,460 h.p./2,600 r.p.m./12,500 ft. (3,800 m)

Note: This engine has the same cylinder blocks as the Rolls-Royce Peregrine from which it was developed.

Vulture II: Same as Vulture I. Propeller rotates in opposite direction.

Vulture IV: Similar to Vulture I and II.



Pratt & Whitney R-1830
Royce Merlin
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Rolls-Royce Merlin (1-speed 1-stage)

Model **Merlin 45.**

Type 12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Spur reduction gear, ratio 0.48:1.

Supercharger Gear-driven 1-speed supercharger, ratio 9.1:1.

Carburation 1 S.U. AVT-40 2-barrel updraft carburetor with automatic mixture control and boost control.

Ignition 2 B.T.H. C5SE12-S or Rotax NES12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (4.9 kg/cm²). Dry sump.

Starter B.T.H. CA-4570 electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27.0 lit
Compression ratio	6.0:1	6.0:1
Width	29.8 in.	757 mm
Height	41.2 in.	1 046 mm
Length	70.6 in.	1 793 mm
Frontal area	5.8 sq.ft.	0.54 m ²
Weight	1,385 lb.	623 kg
Weight/horsepower	0.91 lb./h.p.	0.41 kg/hp
Fuel consumption (cr.)	0.52 lb./h.p./hr.	235 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.92 h.p./cu.in.	56.1 hp/lit
Output/piston area	5.51 h.p./sq.in.	0.85 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15.2 m/sec
B.m.e.p. (max.)	243 lb./sq.in.	17.1 kg/cm ²

Rating (take-off) 1,185 h.p./3,000 r.p.m./54.3 in. (1 380 mm) Hg. boost

Rating (military) 1,515 h.p./3,000 r.p.m./11,000 ft. (3 400 m)

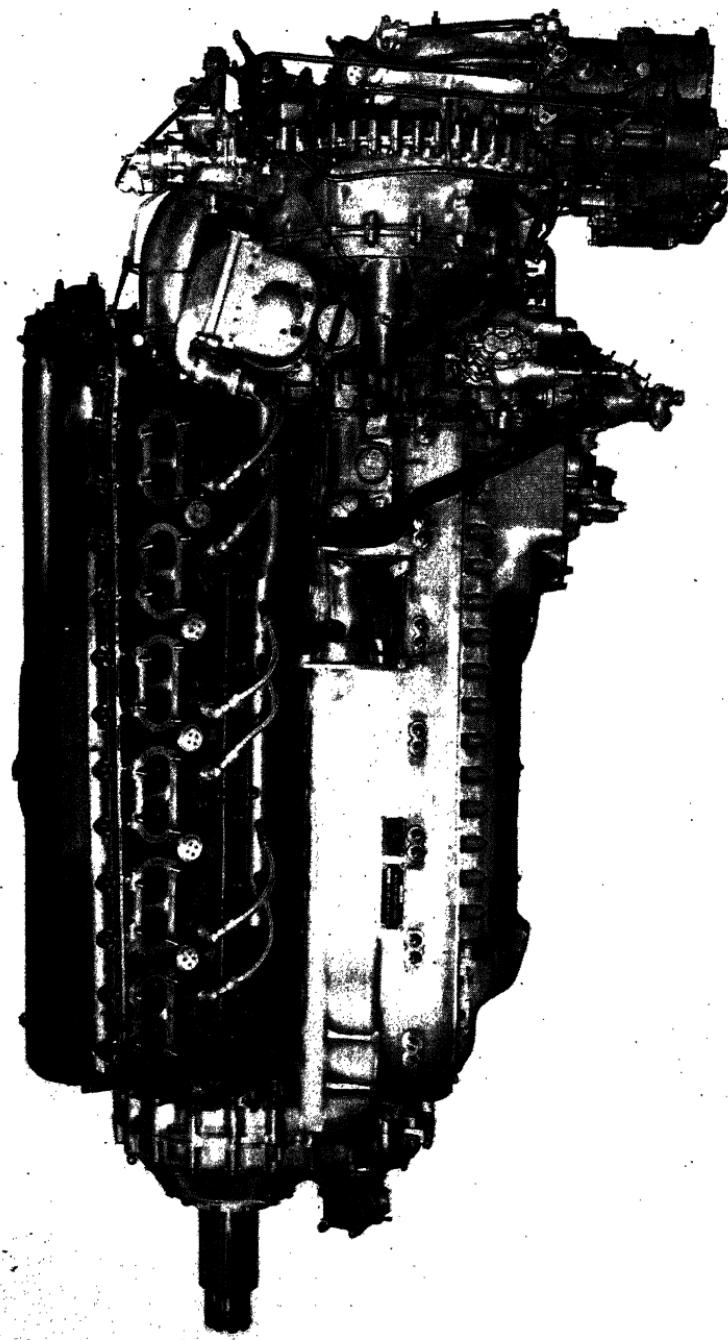
Rating (normal) 1,200 h.p./2,850 r.p.m./16,000 ft. (4 900 m)

Rating (cruising) 1,060 h.p./2,650 r.p.m./14,500 ft. (4 400 m)

Merlin 30: Similar to Merlin 45. 1,260 h.p./3,000 r.p.m./take-off.

Merlin 32: Similar to Merlin 45. Detachable cylinder heads. Reduction gear ratio 0.48:1. 1-speed 1-stage supercharger, ratio 8.588:1. Cartridge type starter, 100/130 grade gasoline. Develops maximum power at take-off and at low altitudes. Used by Fleet Air Arm in carrier-based aircraft. See photograph on opposite page. All other data restricted, January, 1945.

Merlin 46: 1,100 h.p./3,000 r.p.m./take-off; 1,415 h.p./3,000 r.p.m./14,000 ft. (4 300 m) military rating; 1,115 h.p./2,850 r.p.m./19,000 ft. (5 800 m) normal rating. Reduction gear ratio 0.48:1. 1-speed 1-stage supercharger, ratio 9.1:1. 100/130 grade gasoline.



Ro. Royce Merlin 2-speed age

Rolls-Royce Merlin (2-speed 1-stage)

Model Merlin XX.

Type 12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.42:1.

Supercharger Gear-driven 2-speed supercharger, ratios 8.15:1 and 9.49:1.

Carburation 1 S.U. AVT-40 2-barrel updraft carburetor with automatic mixture control and boost control.

Ignition 2 B.T.H. C5SE12-S or Rotax NES12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (4.9 kg/cm²). Dry sump.

Starter B.T.H. CA-4750 electric starter.

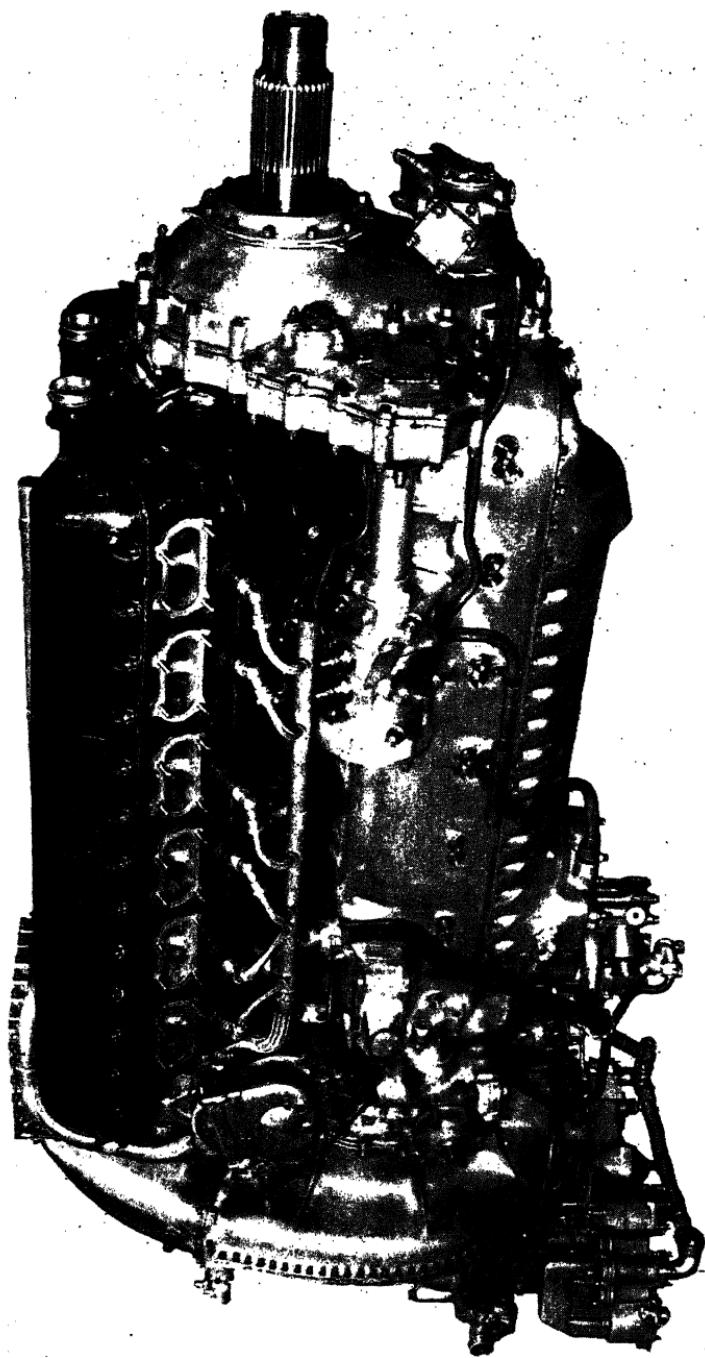
Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27.0 lit
Compression ratio	6.0:1	6.0:1
Width	29.8 in.	757 mm
Height	41.2 in.	1 046 mm
Length	70.6 in.	1 793 mm
Frontal area	5.8 sq.ft.	0.54 m ²
Weight	1,450 lb.	658 kg
Weight/horsepower	0.98 lb./h.p.	0.44 kg/h.p
Fuel consumption (cr.)	0.52 lb./h.p./hr.	235 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.90 h.p./cu.in.	54.8 hp/lit
Output/piston area	5.38 h.p./sq.in.	0.83 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15.2 m/sec
B.m.e.p. (max.)	238 lb./sq.in.	16.7 kg/cm ²
Rating (take-off)	1,280 h.p./3,000 r.p.m./54.3 in. (1 380 mm) Hg. boost	
Rating (military, low)	1,480 h.p./3,000 r.p.m./6,000 ft. (1 800 m)	
Rating (military, high)	1,480 h.p./3,000 r.p.m./12,500 ft. (3 800 m)	
Rating (normal, low)	1,240 h.p./2,850 r.p.m./10,000 ft. (3 000 m)	
Rating (normal, high)	1,175 h.p./2,850 r.p.m./17,500 ft. (5 300 m)	
Rating (cruising, low)	1,100 h.p./2,650 r.p.m./9,250 ft. (2 800 m)	
Rating (cruising, high)	1,040 h.p./2,650 r.p.m./16,000 ft. (4 900 m)	

Merlin X: 1,075 h.p./3,000 r.p.m./take-off; 1,130 h.p./3,000 r.p.m./5,250 ft. (1 600 m) and 1,010 h.p./3,000 r.p.m./17,750 ft. (5 400 m) military rating; 1,035 h.p./2,600 r.p.m./2,250 ft. (700 m) and 960 h.p./2,600 r.p.m./13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.42:1. 2-speed 1-stage supercharger, ratios 6.39:1 and 8.75:1. 87-octane gasoline.

Merlin 21, 22, 23, 25: Similar to Merlin XX.

Merlin 28, 29, 31, 33, 38: Similar to Merlin XX. Built by Packard Motor Car Company in the United States of America. See page 123.

Merlin 55: Similar to Merlin XX.



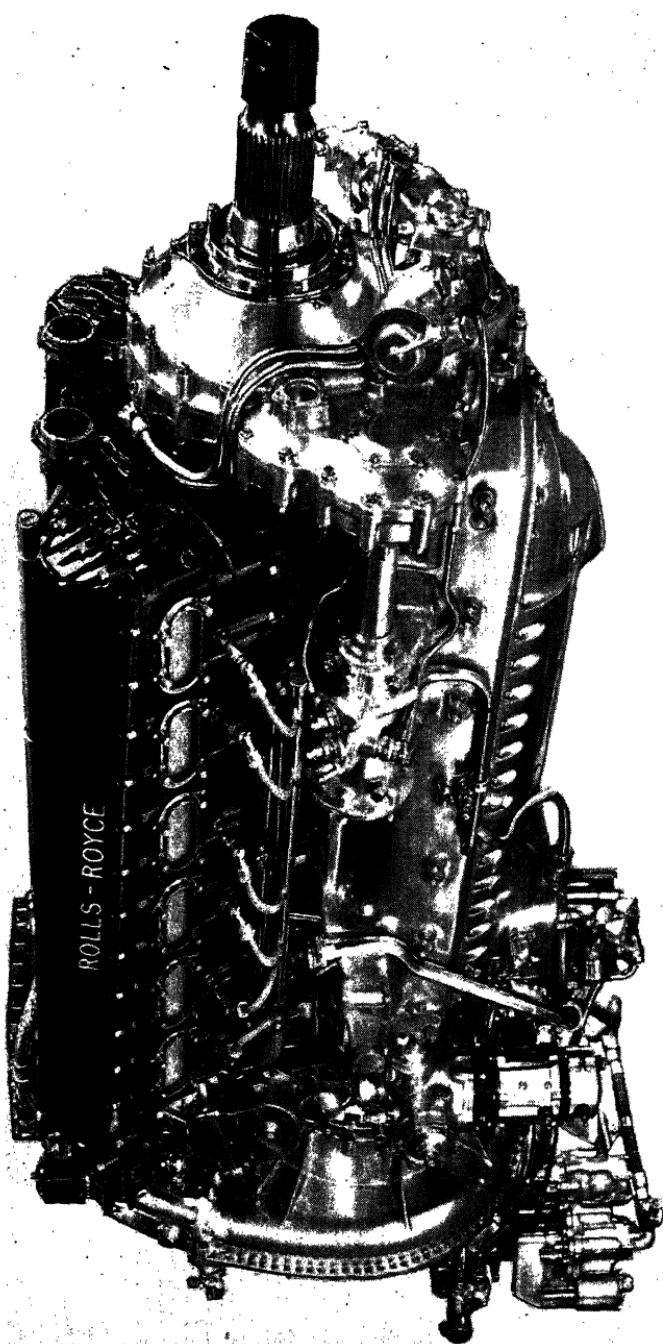
Pratt & Whitney R-1830
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Rolls-Royce Merlin (2-speed 2-stage)

Model	Merlin 61.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.42:1.	
Supercharger	Gear-driven 2-speed 2-stage supercharger, ratios 6.39:1 and 8.03:1. Water-cooled inter-stage passages. Water-cooled after-cooler.	
Carburation	1 S.U. AVT-44 2-barrel updraft carburetor with automatic mixture control and progressive boost control.	
Ignition	2 B.T.H. C6SE12 or Rotax NSE12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (4,9 kg/cm ²). Dry sump.	
Starter	B.T.H. CA-4750 electric starter.	
Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6.0:1
Width	29.8 in.	757 mm
Height	45.1 in.	1 145 mm
Length	78.0 in.	1 981 mm
Frontal area	6.1 sq.ft.	0.57 m ²
Weight	1,640 lb.	744 kg
Weight/horsepower	1.04 lb./h.p.	0.47 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	245 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.95 h.p./cu.in.	58.1 hp/lit
Output/piston area	5.72 h.p./sq.in.	0.88 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15.2 m/sec
B.m.e.p. (max.)	251 lb./sq.in.	17.6 kg/cm ²
Rating (take-off)	1,290 h.p./3,000 r.p.m./54.3 in. (1 380 mm) Hg. boost	
Rating (military, high)	1,570 h.p./3,000 r.p.m./11,500 ft. (3 500 m)	
Rating (military, low)	1,390 h.p./3,000 r.p.m./23,500 ft. (7 200 m)	
Rating (normal, high)	1,400 h.p./2,850 r.p.m./12,000 ft. (3 700 m)	
Rating (normal, low)	1,250 h.p./2,850 r.p.m./24,000 ft. (7 300 m)	
Rating (cruising, high)	1,090 h.p./2,650 r.p.m./16,000 ft. (4 900 m)	
Rating (cruising, low)	990 h.p./2,650 r.p.m./25,250 ft. (7 700 m)	

The latest model of the Merlin 61 has a maximum rating of more than 1,650 h.p./3,000 r.p.m.

Note: Sea-level atmospheric pressure is maintained in the intake manifolds of this engine to an altitude of more than 40,000 ft. (12 200 m).



Ro. Rolls-Royce Merlin 2-speed 2-stage

Rolls-Royce Merlin (2-speed 2-stage)

Model	Merlin 63.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.477:1.	
Supercharger	Gear-driven 2-speed 2-stage supercharger, ratios 6.39:1 and 8.03:1. Water-cooled inter-stage passages. Water-cooled after-cooler.	
Carburation	1 S.U. AVT-44 2-barrel updraft carburetor with automatic mixture control and progressive boost control.	
Ignition	2 B.T.H. C6SE12 or Rotax NSE12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 55-70 lb./sq.in. (3.9-4.9 kg/cm ²). Dry sump.	
Starter	B.T.H. CA-4750 electric starter.	
Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6.0:1
Width	29.8 in.	757 mm
Height	45.1 in.	1 145 mm
Length	78.0 in.	1 981 mm
Frontal area	6.1 sq.ft.	0,57 m ²
Weight	1,665 lb.	755 kg
Weight/horsepower	1.01 lb./h.p.	0,46 kg/hp
Fuel consumption (cr.)	0.54 lb./h.p./hr.	245 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	1.00 h.p./cu.in.	61,1 hp/lit
Output/piston area	6.00 h.p./sq.in.	0,93 hp/cm ²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	264 lb./sq.in.	18,6 kg/cm ²

Rating (maximum)

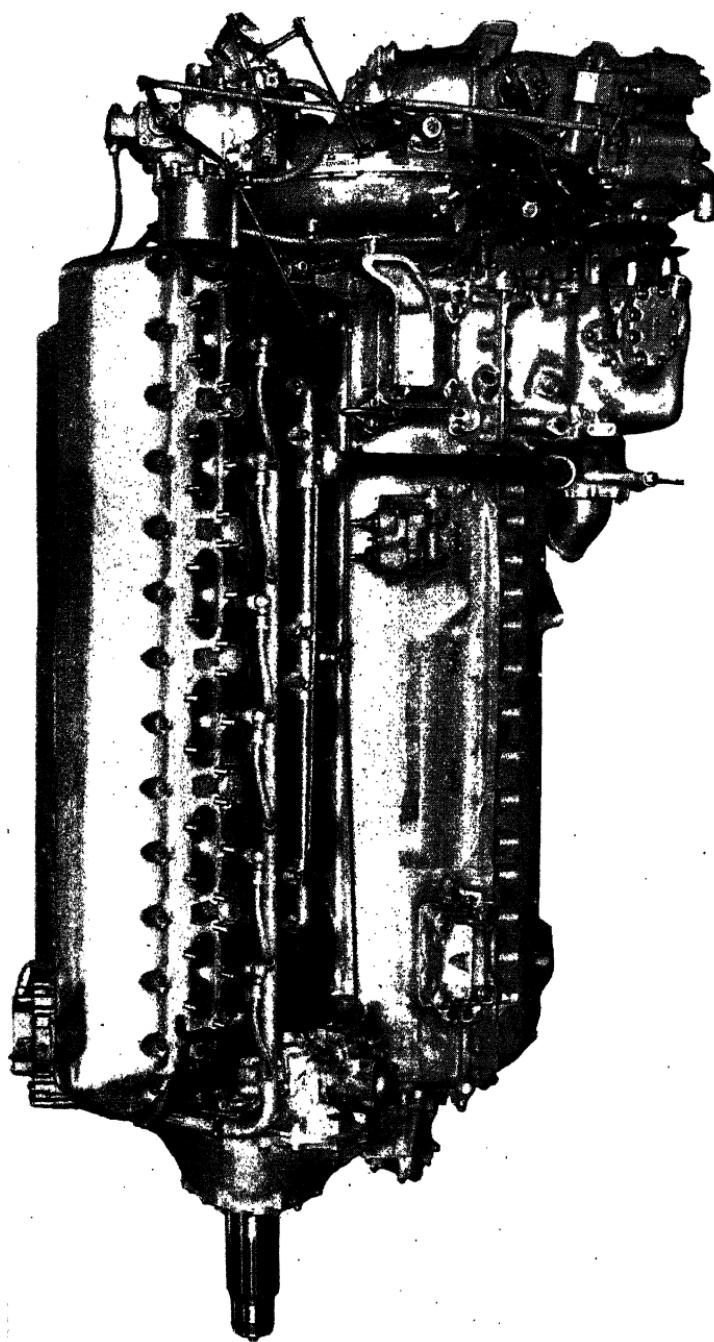
More than 1,650 h.p./3,000 r.p.m. All other data restricted, January, 1945.

Merlin 63A: Same as Merlin 63.

Merlin 72, 73: Similar to Merlin 63. 1,750 h.p./3,000 r.p.m./take-off.

Merlin 76, 77: Similar to Merlin 72, 73.

Note: Sea-level atmospheric pressure is maintained in the intake manifolds of these engines to an altitude of more than 40,000 ft. (12 200 m).



Ro Royce Griffon ag

Rolls-Royce Griffon (1-stage)

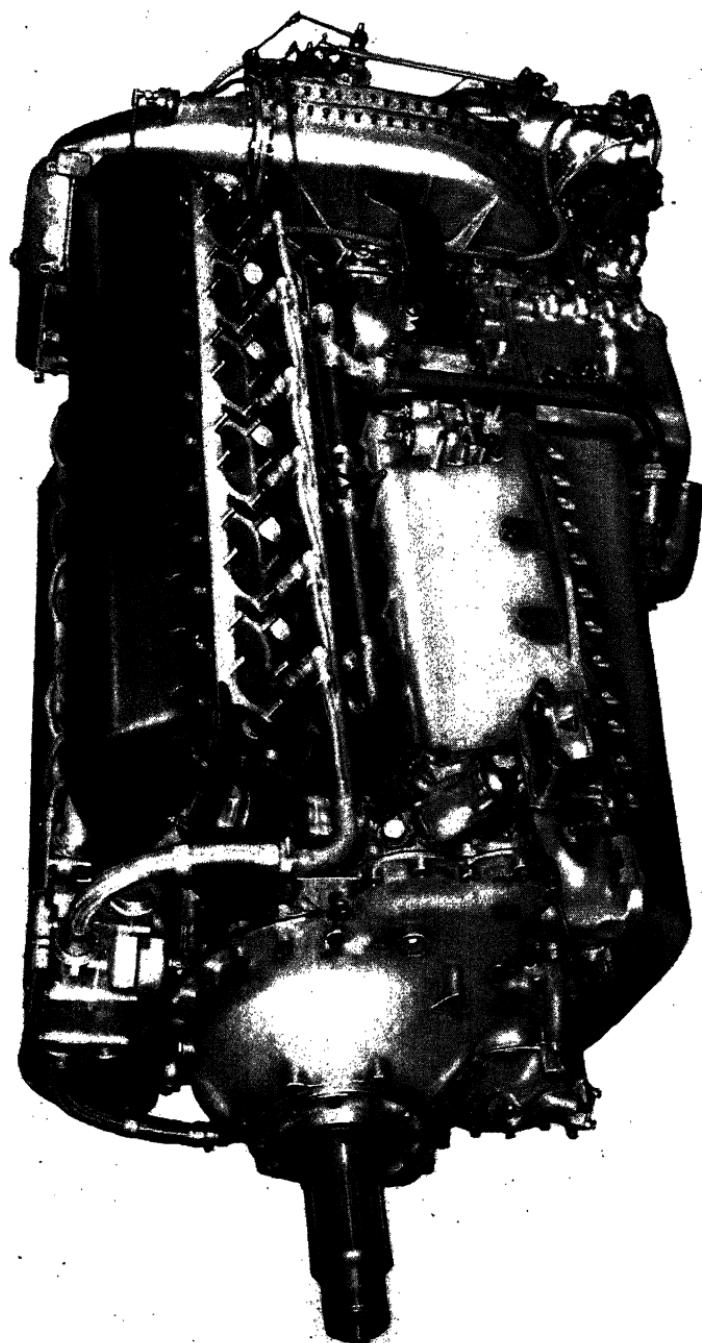
Model	Griffon IV.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft, 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1. Rotol remote drive gear box for accessories.	
Supercharger	Gear-driven 2-speed 1-stage supercharger, ratios 7.85:1 and 10.68:1. Automatic gear change at critical altitude.	
Carburation	1 S.U. AVT-44/203 2-barrel updraft carburetor with automatic mixture control and progressive boost control.	
Ignition	1 B.T.H. CSH12-12S/4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 45-60 lb./sq.in. (3.2-4.2 kg/cm ²). Direct feed to all crankshaft main bearings. Dry sump.	
Starter	Plessy Coffman cartridge starter, or approved electric starter.	
Bore	6.00 in.	152 mm
Stroke	6.60 in.	168 mm
Displacement	2,240 cu.in.	36.7 lit
Compression ratio	6.0:1	6.0:1
Width	30.3 in.	769 mm
Height	45.3 in.	1 150 mm
Length	71.1 in.	1 805 mm
Frontal area	6.5 sq.ft.	0.60 m ²
Weight	1,900 lb.	862 kg
Weight/horsepower	1.08 lb.	0.49 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.78 h.p./cu.in.	47.7 hp/lit
Output/piston area	5.19 h.p./sq.in.	0.80 hp/cm ²
Piston speed (max.)	3,025 ft./min.	15.4 m/sec
B.m.e.p. (max.)	224 lb./sq.in.	15.7 kg/cm ²

Rating (maximum)

More than 1,750 h.p./2,750 r.p.m. All other data restricted, January, 1945.

Griffon II: Similar to Griffon IV.

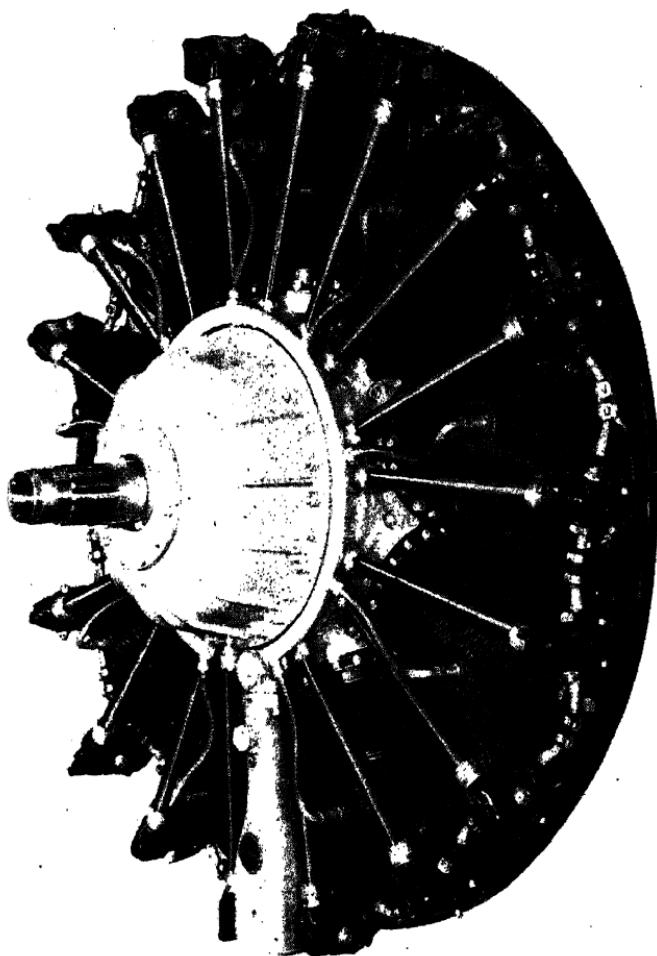
Note: The Rolls-Royce Griffon has the same displacement as the Rolls-Royce R racing engine which won the Schneider Trophy outright in 1931. The R engine was rated at 2,600 h.p./3,000 r.p.m./sea level at 67.0 in. (1 702 mm) Hg. boost with a b.m.e.p. of 310 lb./sq.in. (21.8 kg/cm²), using 92-octane gasoline.



Rolls-Royce Griffon (2-stage)

Rolls-Royce Griffon (2-stage)

Model	Griffon 65.	
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1 or 0.51:1. Rotol remote drive gear box for accessories. Equipped for Rotol 5-blade constant speed variable pitch propeller.	
Supercharger	Gear-driven 2-speed 2-stage supercharger, ratios 5.84:1 and 7.58:1. Automatic gear change at critical altitude. Water-cooled inter-stage passages. Water-cooled aftercooler.	
Carburation	1 S.U. AVT-140 2-barrel updraft carburetor with automatic mixture control and progressive boost control.	
Ignition	1 B.T.H. CSH12-12S/4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 45-60 lb./sq.in. (3,2 - 4,2 kg/cm ²). Direct feed to all crankshaft main bearings. Dry sump.	
Starter	Plessy Coffman L3/1HT cartridge starter, or approved electric starter.	
Bore	6.00 in.	152 mm
Stroke	6.60 in.	168 mm
Displacement	2,240 cu.in.	36,7 lit
Compression ratio	6.0:1	6,0:1
Width	29.5 in.	750 mm
Height	46.0 in.	1 168 mm
Length	81.0 in.	2 057 mm
Frontal area	6.6 sq.ft.	0,61 m ²
Weight	2,090 lb.	948 kg
Weight/horsepower	1.04 lb./h.p.	0,47 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.89 h.p./cu.in.	54,5 hp/lit
Output/piston area	5.89 h.p./sq.in.	0,91 hp/cm ²
Piston speed (max.)	3,025 ft./min.	15,4 m/sec
B.m.e.p. (max.)	256 lb./sq.in.	18,0 kg/cm ²
Rating (maximum)	More than 2,000 h.p./2,750 r.p.m. All other data restricted, January, 1945.	

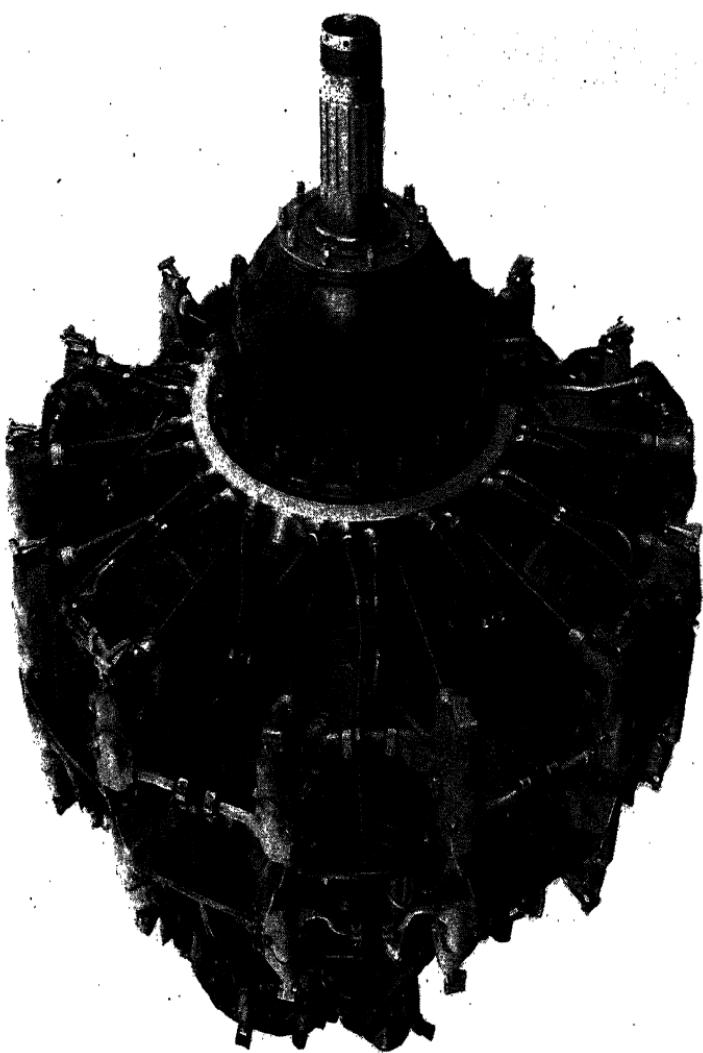


Commonwealth Aircraft Pratt & Whitney Wasp R-1340

**Commonwealth Aircraft
Pratt & Whitney Wasp R-1340**

Model R-1340 S1H1-G.
 Type 9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.
 Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.67:1.
 Supercharger Gear-driven 1-speed supercharger, ratio 10.0:1.
 Carburation 1 Bendix-Stromberg NA-Y9H updraft carburetor with automatic mixture control.
 Ignition 2 Bendix-Scintilla SB9RN magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
 Lubrication Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3 kg/cm²). Dry sump.
 Starter Optional. Eclipse Series 43 inertia and direct cranking electric starter can be used.

Bore	5.75 in.	146 mm
Stroke	5.75 in.	146 mm
Displacement	1,344 cu.in.	22,0 lit
Compression ratio	6.0:1	6,0:1
Diameter	51.4 in.	1 305 mm
Length	47.8 in.	1 214 mm
Frontal area	14.4 sq.ft.	1,34 m ²
Weight	930 lb.	422 kg
Weight/horsepower	1.55 lb./h.p.	0,70 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	91/96 grade	91/96 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.45 h.p./cu.in.	27,2 hp/lit
Output/piston area	2.56 h.p./sq.in.	0,40 hp/cm ²
Piston speed (max.)	2,156 ft./min.	10,9 m/sec
B.m.e.p. (max.)	157 lb./sq.in.	11,0 kg/cm ²
Rating (take-off)	600 h.p./2,250 r.p.m./36.5 in. (927 mm) Hg. boost	
Rating (normal)	550 h.p./2,200 r.p.m./5,000 ft. (1 500 m)	
Rating (max. cruising)	400 h.p./2,100 r.p.m./9,000 ft. (2 700 m)	



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**Commonwealth Aircraft
Pratt & Whitney Twin Wasp R-1830**

Model R-1830 S1C3-G.

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary reduction gear, ratio 0.56:1.

Supercharger Gear-driven 1-speed supercharger, ratio 7.15:1.

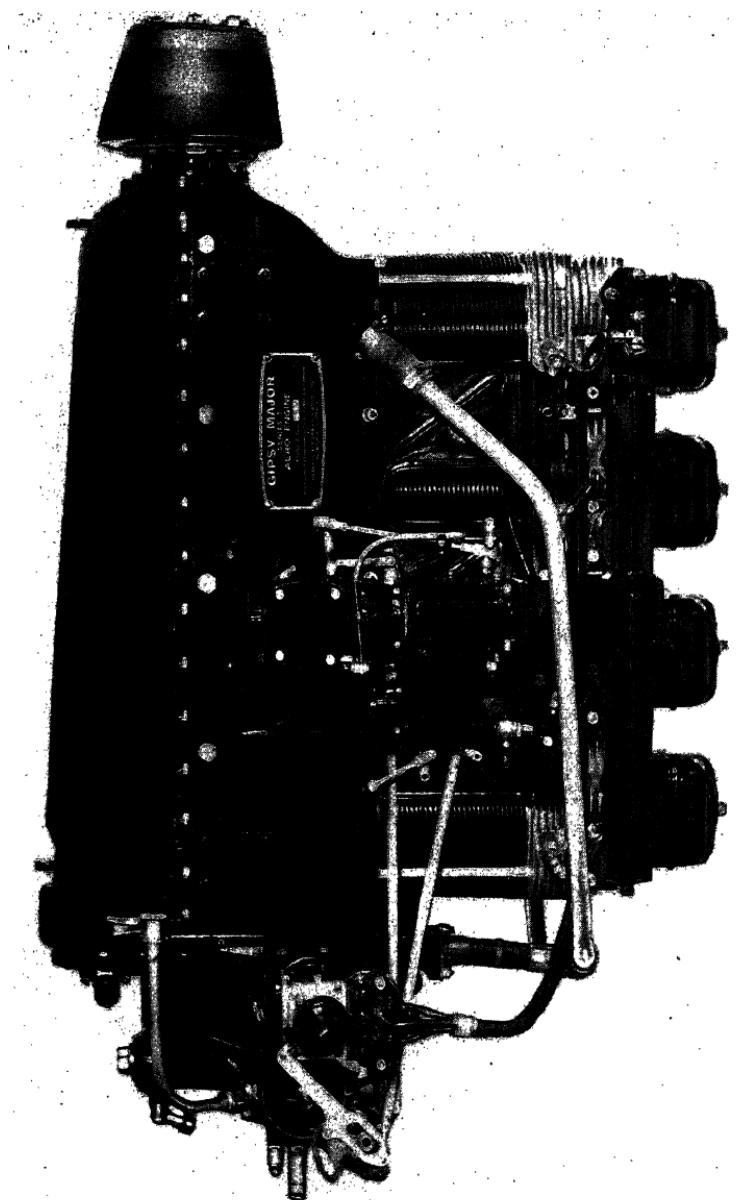
Carburation 1 Bendix-Stromberg PD-12B8 or PD-12H1 2-barrel injection type downdraft carburetor with automatic mixture control.

Ignition 2 Bendix-Scintilla SF14LN-3 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 75-100 lb./sq.in. (5,3-7,0 kg/cm²). Dry sump.

Starter Optional. Eclipse Series 43 inertia and direct cranking electric starter can be used.

Bore	.....	5.50 in.	140 mm
Stroke	.....	5.50 in.	140 mm
Displacement	.....	1.830 cu.in.	30,0 lit
Compression ratio	.....	6.7:1	6,7:1
Diameter	.....	48.1 in.	1 221 mm
Length	.....	62.7 in.	1 593 mm
Frontal area	.....	12.6 sq.ft.	1,17 m ²
Weight	.....	1,460 lb.	662 kg
Weight/horsepower	.....	1.22 lb./h.p.	0,55 kg/hp
Fuel consumption (cr.)	.....	0.44 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	.....	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	.....	91/96 grade	91/96 grade
Oil grade (viscosity)	.....	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	.....	0.66 h.p./cu.in.	40,0 hp/lit
Output/piston area	.....	3.60 h.p./sq.in.	0,56 hp/cm ²
Piston speed (max.)	.....	2,475 ft./min.	12,6 m/sec
B.m.e.p. (max.)	.....	192 lb./sq.in.	13,5 kg/cm ²
Rating (take-off)	.....	1,200 h.p./2,700 r.p.m./48.0 in. (1 219 mm)	Hg. boost
Rating (military)	.....	1,200 h.p./2,700 r.p.m./3,700 ft. (1 100 m)	
Rating (normal)	.....	1,100 h.p./2,550 r.p.m./7,500 ft. (2 300 m)	
Rating (max. cruising)	.....	700 h.p./2,250 r.p.m./17,000 ft. (5 200 m)	



General Motors-Holmes De Havilland Gipsy Major

**General Motors-Holdens
De Havilland Gipsy Major**

Model **Gipsy Major I.**

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 2-piece magnesium alloy crankcase. Cylinders with steel barrels and detachable aluminum-bronze heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings. Equipped for fixed pitch propeller.

Supercharger None.

Carburation 1 Hobson A148 downdraft carburetor with automatic mixture control.

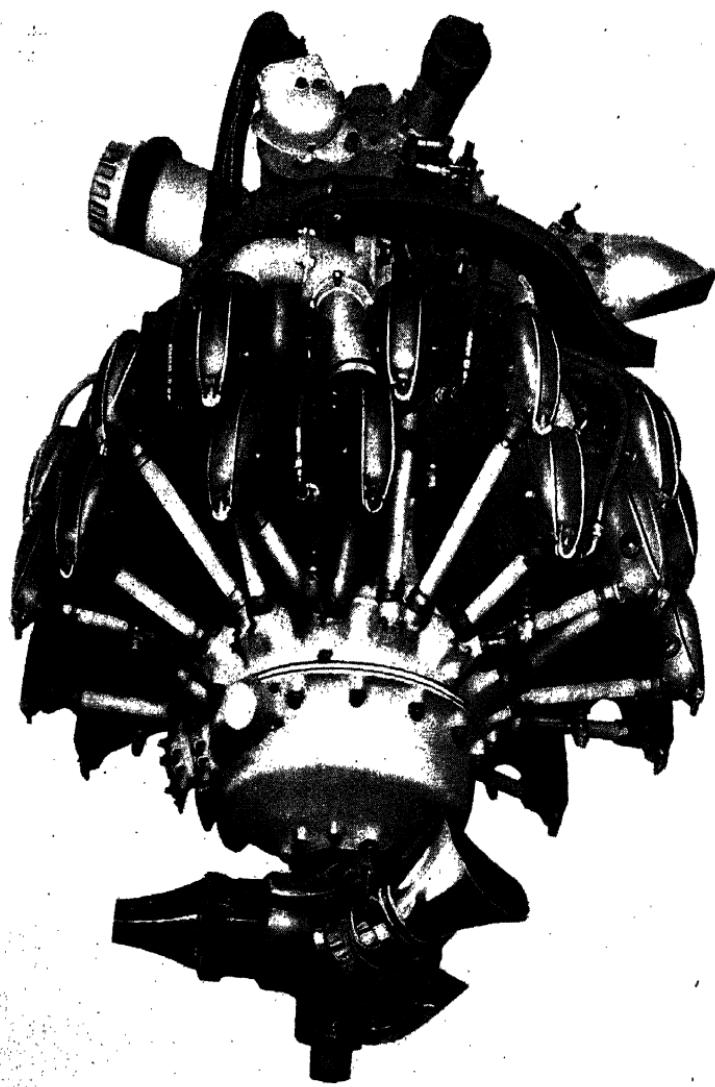
Ignition 2 B.T.II. AG4-4 or Bendix-Scintilla SB-4 magnetos. 2 12-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 40-45 lb./sq.in. (2,8 - 3,2 kg/cm²). Dry sump.

Starter None.

Bore	4.65 in.	118 mm
Stroke	5.50 in.	140 mm
Displacement	374 cu.in.	6,1 lit
Compression ratio	5.25:1	5.25:1
Width	20.0 in.	508 mm
Height	29.6 in.	752 mm
Length	47.6 in.	1 212 mm
Frontal area	3.8 sq.ft.	0,35 m ²
Weight	315 lb.	143 kg
Weight/horsepower	2.39 lb./h.p.	1,08 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.35 h.p./cu.in.	21,3 hp/lit
Output/piston area	1.91 h.p./sq.in.	0,30 hp/cm ²
Piston speed (max.)	2,154 ft./min.	11,0 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	8,3 kg/cm ²
Rating (take-off)	132 h.p./2,350 r.p.m.	
Rating (normal)	122 h.p./2,100 r.p.m./sea level	
Rating (cruising)	85 h.p./2,000 r.p.m./sea level	

This engine is known as the *Gipsy Trainer* when used in Royal Australian Air Force aircraft.



Gnome-Rhône 14M

Gnome-Rhone 14M

Model 14M-8.

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.71:1.

Supercharger Gear-driven 1-speed supercharger.

Carburation 1 Bronzavia updraft carburetor with automatic boost control and altitude control.

Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Air Equipment electric inertia starter.

Bore	4.80 in.	122 mm
Stroke	4.57 in.	116 mm
Displacement	1,159 cu.in.	19,0 lit
Compression ratio	6.5:1	6.5:1
Diameter	37.4 in.	950 mm
Length	49.2 in.	1 251 mm
Frontal area	7.6 sq.ft.	0,70 m ²
Weight	924 lb.	419 kg
Weight/horsepower	1.23 lb./h.p.	0,56 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.65 h.p./cu.in.	39,5 hp/lit
Output/piston area	2.96 h.p./sq.in.	0.46 hp/cm ²
Piston speed (max.)	2,258 ft./min.	11,7 m/sec
B.m.e.p. (max.)	151 lb./sq.in.	10,6 kg/cm ²

Rating (take-off) 750 h.p./3,030 r.p.m./39.8 in. (1 010 mm) Hg. boost

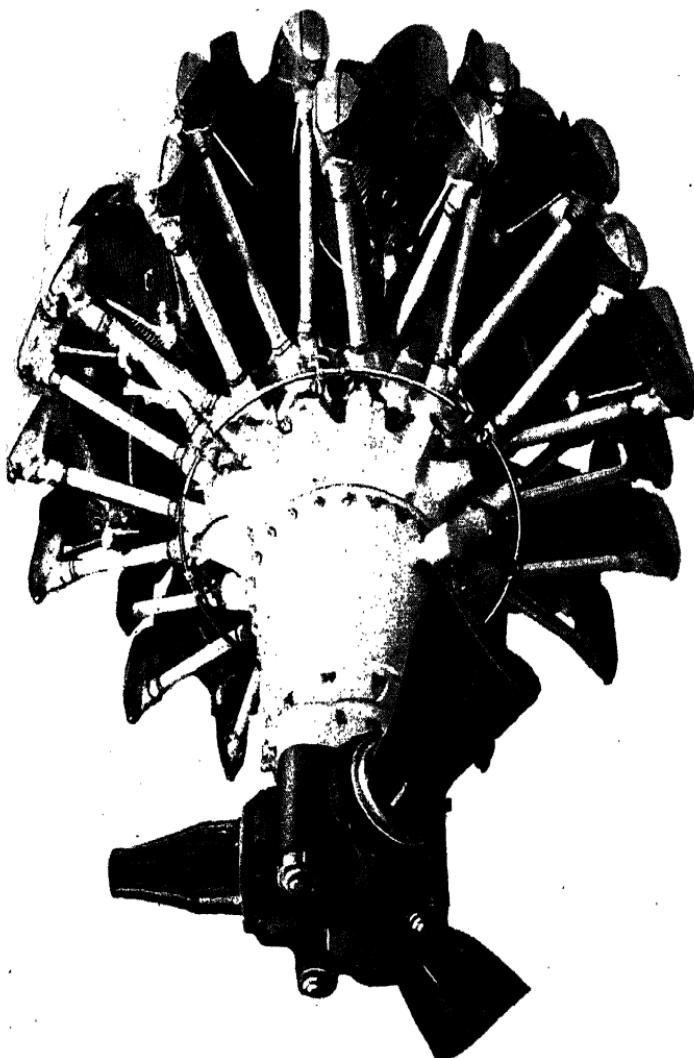
Rating (military) 680 h.p./3,030 r.p.m./7,000 ft. (2 100 m)

Rating (cruising) 570 h.p./2,400 r.p.m./7,000 ft. (2 100 m)

14M-00, 14M-01: 615 h.p./3,000 r.p.m./take-off; 670 h.p./3,000 r.p.m./16,200 ft. (4 900 m) military rating. Geared drive. 1-speed supercharger. 87-octane gasoline.

14M-6, 14M-7: 700 h.p./3,030 r.p.m./take-off; 660 h.p./3,030 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.71:1. 1-speed supercharger. 87-octane gasoline.

14M-9: Same as 14M-8. Propeller rotates in opposite direction.



Gnome-Rhône 4N

Gnome-Rhone 14NModel **14N-48.**

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.50:1.

Supercharger Gear-driven 1-speed supercharger.

Carburation 1 Bronzavia updraft carburetor with automatic boost control and altitude control.

Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Air Equipment electric inertia starter.

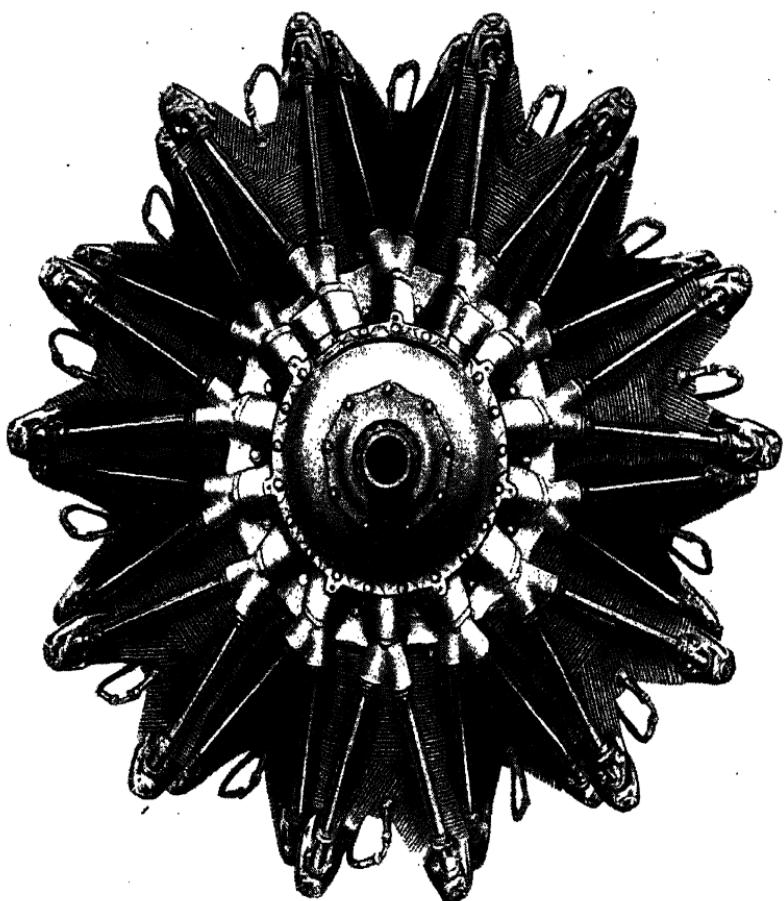
Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	2,360 cu.in.	38,7 lit
Compression ratio	6.8:1	6,8:1
Diameter	50.8 in.	1 290 mm
Length	58.3 in.	1 480 mm
Frontal area	14.0 sq.ft.	1,30 m ²
Weight	1,653 lb.	750 kg
Weight/horsepower	1.40 lb./h.p.	0,64 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.50 h.p./cu.in.	30,5 hp/lit
Output/piston area	3.25 h.p./sq.in.	0,50 hp/cm ²
Piston speed (max.)	2,600 ft./min.	13,2 m/sec
B.m.e.p. (max.)	165 lb./sq.in.	11,6 kg/cm ²

Rating (take-off) 1,180 h.p./2,400 r.p.m./38.6 in. (980 mm) Hg. boost

Rating (military) 1,060 h.p./2,400 r.p.m./12,800 ft. (3 900 m)

Rating (cruising) 850 h.p./2,100 r.p.m./12,800 ft. (3 900 m)

14N-44, 14N-45: 1,050 h.p./2,400 r.p.m./take-off; 980 h.p./2,400 r.p.m./5,700 ft. (1 700 m) military rating. Reduction gear ratio 0.50:1. 1-speed supercharger. 87-octane gasoline.**14N-49:** Same as 14N-48. Propeller rotates in opposite direction.**14N-50:** 1,400 h.p./2,400 r.p.m./take-off; 1,300 h.p./2,400 r.p.m./4,900 ft. (1 700 m) and 1,200 h.p./2,400 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.50:1. 2-speed supercharger. 92-octane gasoline.



Gnome-Rhone 14R

Gnome-Rhone 14R

Model 14R.4.

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary or epicyclic bevel reduction gear, ratio 0.67:1.

Supercharger Gear-driven 2-speed supercharger, ratios 6.5:1 and 9.0:1.

Carburation 1 Bronzavia updraft carburetor with automatic boost control and altitude control.

Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

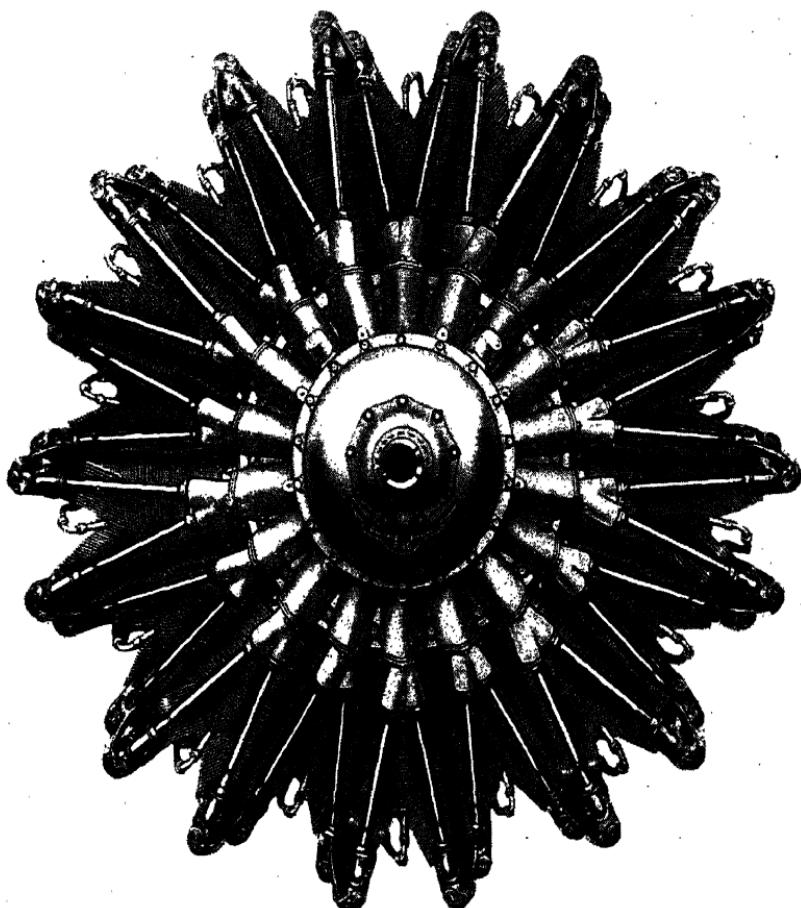
Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Air Equipment electric inertia starter.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	2,360 cu.in.	38,7 lit
Compression ratio	6.8:1	6,8:1
Diameter	51.2 in.	1 297 mm
Length	64.4 in.	1 635 mm
Frontal area	14.3 sq.ft.	1,33 m ²
Weight	1,805 lb.	819 kg
Weight/horsepower	1.10 lb./h.p.	0,49 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.70 h.p./cu.in.	42,9 hp/lit
Output/piston area	4.57 h.p./sq.in.	0,71 hp/cm ²
Piston speed (max.)	2,817 ft./min.	14,3 m/sec
B.m.e.p. (max.)	213 lb./sq.in.	15,0 kg/cm ²
Rating (take-off)	1,590 h.p./2,600 r.p.m./46.5 in. (1 180 mm)	Hg. boost
Rating (military, low)	1,660 h.p./2,600 r.p.m./3,300 ft. (1 000 m)	
Rating (military, high)	1,580 h.p./2,600 r.p.m./18,000 ft. (5 500 m)	
Rating (normal, low)	1,320 h.p./2,400 r.p.m./6,900 ft. (2 100 m)	
Rating (normal, high)	1,230 h.p./2,400 r.p.m./19,700 ft. (6 000 m)	

Note: 100-octane gasoline is used for take-off.

14R-5: Same as 14R-4. Propeller rotates in opposite direction.



Gnome-Rhone 18R

Gnome-Rhone 18R

Model 18R-1.

Type 18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear.

Supercharger Gear-driven 2-speed supercharger.

Carburation 1 Bronzavia updraft carburetor with automatic boost control and altitude control.

Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Air Equipment electric inertia starter.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	3,034 cu.in.	49,7 lit
Compression ratio	6.8:1	6.8:1
Diameter	50.8 in.	1 290 mm
Length	64.2 in.	1 630 mm
Frontal area	14.0 sq.ft.	1,30 m ²
Weight	2,130 lb.	966 kg
Weight/horsepower	0.93 lb./h.p.	0,42 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	120 S.U. secs.	25.1 cs
Output/displacement	0.76 h.p./cu.in.	46,3 hp/lit
Output/piston area	4.92 h.p./sq.in.	0.76 hp/cm ²
Piston speed (max.)	2,817 ft./min.	14,3 m/sec
B.m.e.p. (max.)	231 lb./sq.in.	16,2 kg/cm ²

Rating (take-off) 2,200 h.p./2,600 r.p.m./44.9 in. (1 140 mm) Hg. boost

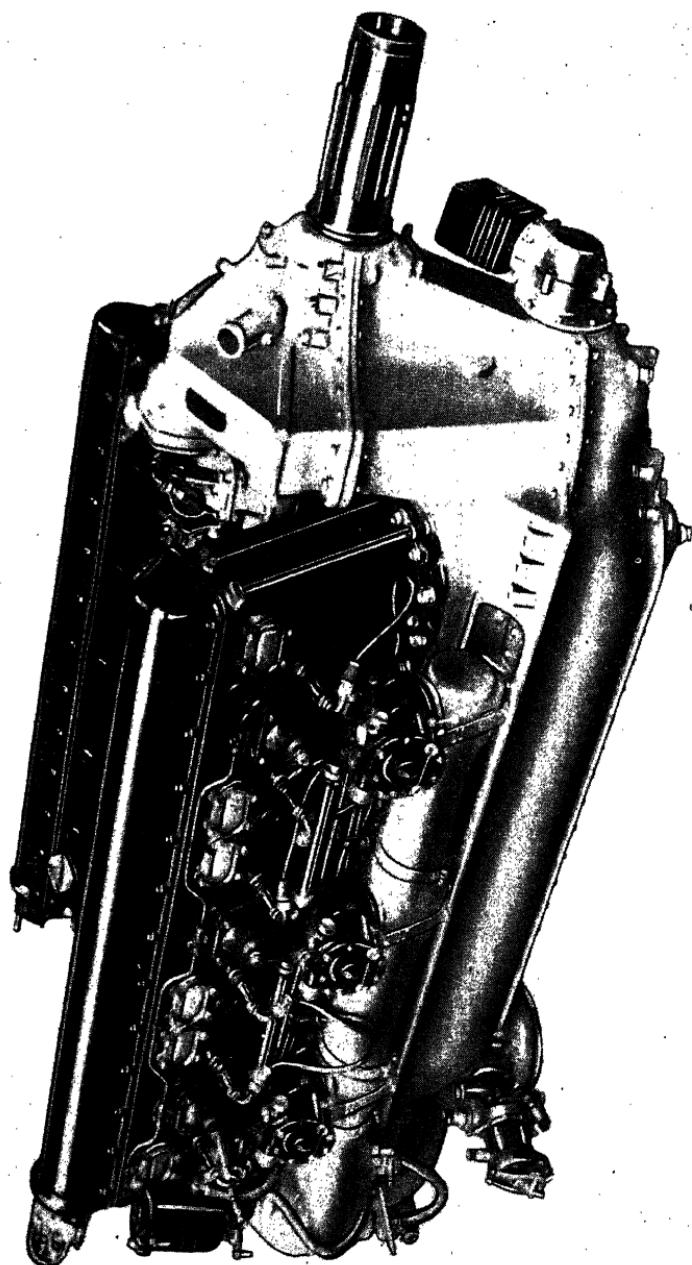
Rating (military, low) 2,300 h.p./2,600 r.p.m./3,300 ft. (1 000 m)

Rating (military, high) 2,150 h.p./2,600 r.p.m./22,300 ft. (6 800 m)

Rating (normal, low) 1,800 h.p./2,400 r.p.m./6,900 ft. (2 100 m)

Rating (normal, high) 1,650 h.p./2,400 r.p.m./23,000 ft. (7 000 m)

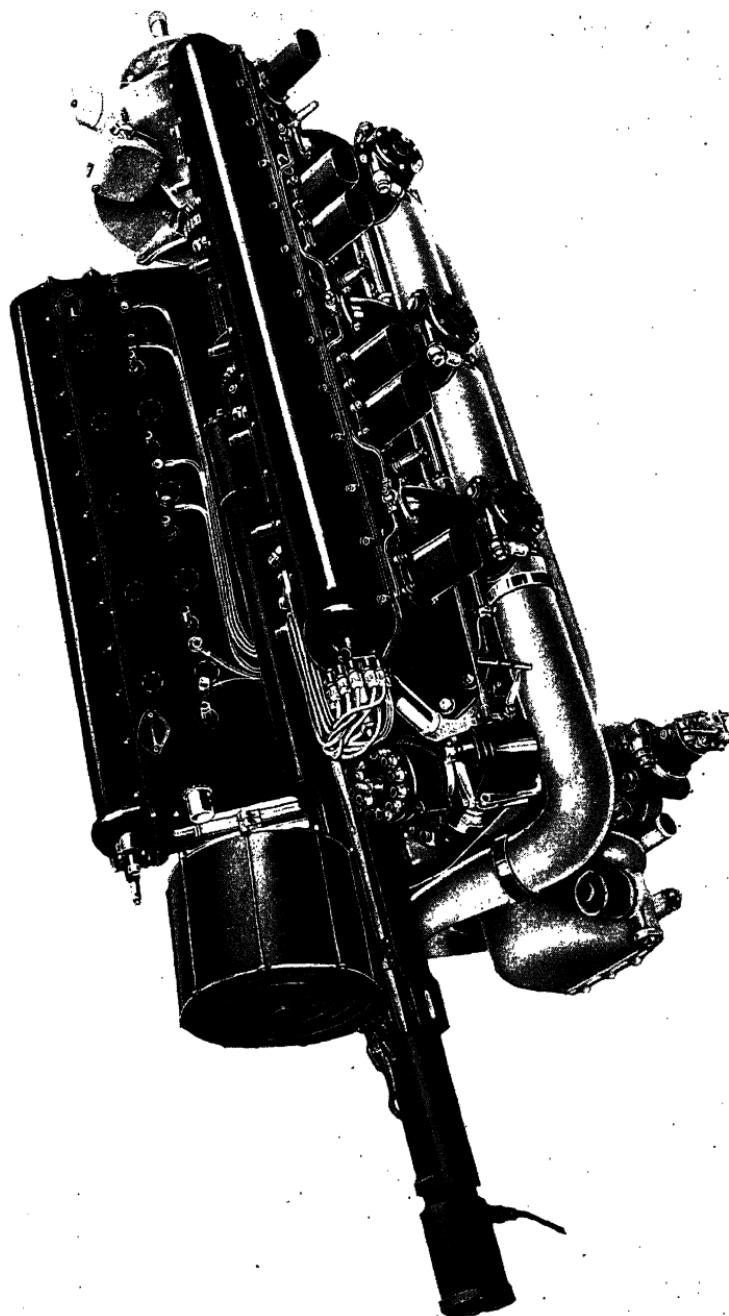
Note: 100-octane gasoline is used for take-off.



Hispano-Suiza 2Y

Hispano-Suiza 12Y

Model	12Y-50.	
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.67:1. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven 1-speed supercharger, ratio 10.0:1.	
Carburation	6 Hispano-Solex 56S2 updraft carburetors with automatic pressure regulators for altitude control.	
Ignition	2 Voltex R.B. P12A magnetos. 2 18-mm. short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 85 lb./sq.in. (6,0 kg/cm ²). Dry sump.	
Starter	Air Equipment compressed gas starting system.	
Bore	5.90 in.	150 mm
Stroke	6.69 in.	170 mm
Displacement	2,197 cu.in.	36,0 lit
Compression ratio	7.0:1	7,0:1
Width	29.9 in.	764 mm
Height	37.0 in.	945 mm
Length	84.3 in.	2 137 mm
Frontal area	5.3 sq.ft.	0,49 m ²
Weight	1,085 lb.	492 kg
Weight/horsepower	0.99 lb./h.p.	0,45 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.50 h.p./cu.in.	30,5 hp/lit
Output/piston area	3.34 h.p./sq.in.	0,52 hp/cm ²
Piston speed (max.)	2,787 ft./min.	14,2 m/sec
B.m.e.p. (max.)	158 lb./sq.in.	11,1 kg/cm ²
Rating (take-off)	1,100 h.p./2,500 r.p.m./40.4 in. (1 025 mm) Hg. boost	
Rating (military)	1,000 h.p./2,500 r.p.m./10,800 ft. (3 300 m)	
Rating (cruising)	770 h.p./2,250 r.p.m./13,100 ft. (4 000 m)	
12Y-30, 12Y-31:	830 h.p./2,400 r.p.m./take-off; 860 h.p./2,400 r.p.m./10,700 ft. (3 300 m) military rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 10.0:1. 87-octane gasoline. Hollow propeller shaft for cannon.	
12Y-32, 12Y-33:	960 h.p./2,400 r.p.m./take-off; 955 h.p./2,400 r.p.m./7,400 ft. (2 300 m) military rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 10.0:1. 87-octane gasoline.	
12Y-36, 12Y-37:	1,050 h.p./2,400 r.p.m./take-off; 970 h.p./2,400 r.p.m./7,400 ft. (2 300 m) military rating. Reduction gear ratio 0.55:1. 1-speed supercharger, ratio 8.3:1. 87-octane gasoline.	
12Y-51:	Same as 12Y-50. Propeller rotates in opposite direction.	

 Hispano-Suiza
2Y Hispano-Suiza
cannon

Hispano-Suiza 12Z

Model 12Z-1.

Type 12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase, 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners, 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft, 6-throw 1-piece crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.44:1. Hollow propeller shaft for cannon.

Supercharger Gear-driven 1-speed supercharger, ratio 10.0:1.

Carburation 12 small Hispano carburetors with automatic pressure regulators for altitude control.

Ignition 2 R.B. magnetos, 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 85 lb./sq.in. (6.0 kg/cm²). Dry sump.

Starter Compressed gas starting system.

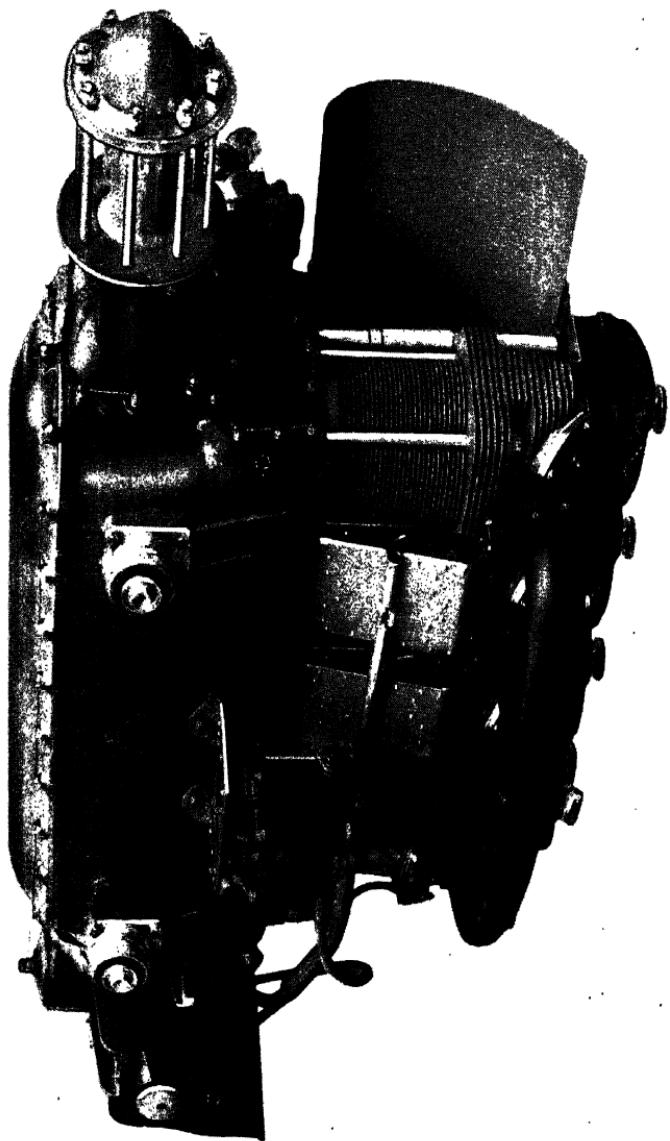
Bore	5.90 in.	150 mm
Stroke	6.69 in.	170 mm
Displacement	2,197 cu.in.	36,0 lit
Compression ratio	7.0:1	7,0:1
Width	30.3 in.	770 mm
Height	37.0 in.	945 mm
Length	84.6 in.	2 150 mm
Frontal area	5.4 sq.ft.	0,50 m ²
Weight	1,268 lb.	575 kg
Weight/horsepower	0.98 lb./h.p.	0,44 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100 S.U. sec.	20,5 cs
Output/displacement	0.59 h.p./cu.in.	36,1 hp/lit
Output/piston area	3.95 h.p./sq.in.	0,61 hp/cm ²
Piston speed (max.)	3,122 ft./min.	15,9 m/sec
B.m.e.p. (max.)	167 lb./sq.in.	11,7 kg/cm ²

Rating (take-off) 1,300 h.p./2,800 r.p.m.

Rating (military) 1,200 h.p./2,800 r.p.m./13,100 ft. (4 000 m)

Rating (cruising) 1,000 h.p./2,500 r.p.m./13,100 ft. (4 000 m)

This engine has a modified intake manifold with carburetors in the vee between the cylinder blocks. It is adaptable to direct fuel injection. It develops 1,500 h.p./2,800 r.p.m. at take-off with 100-octane gasoline.



Renau 4P Benga

Renault 4P Bengali

Model 4P-ei.

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads, 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Zenith downdraft carburetor.

Ignition 2 Scintilla magnetos. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm²). Dry sump.

Starter Air Equipment electric starter.

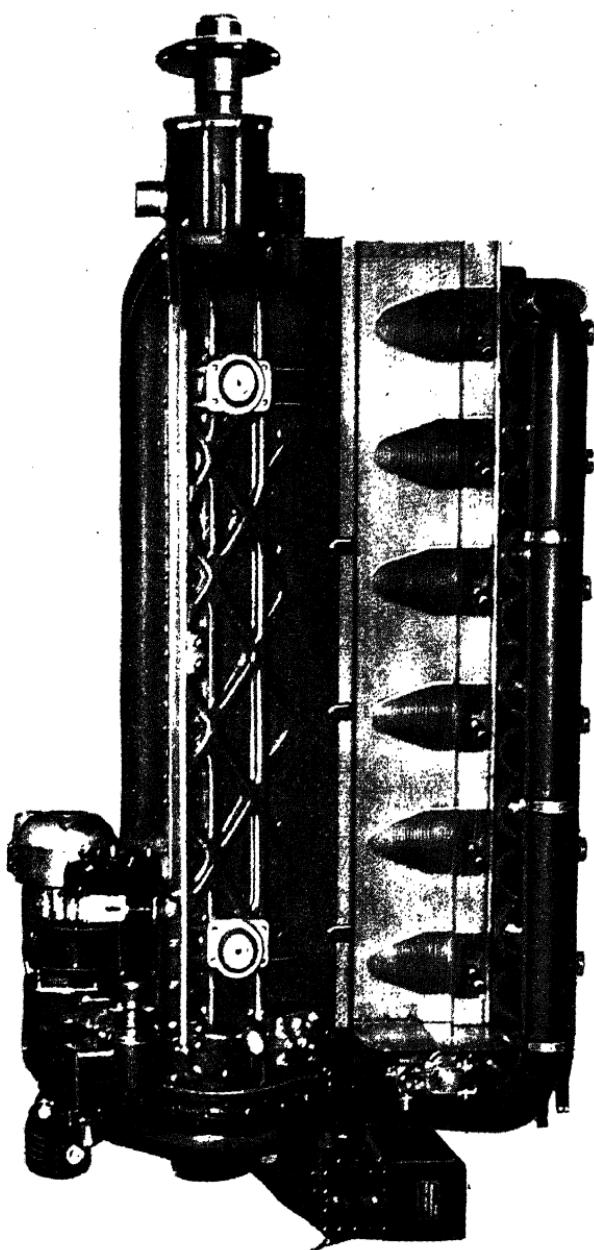
Bore	4.72 in.	120 mm
Stroke	5.50 in.	140 mm
Displacement	384 cu.in.	6,3 lit
Compression ratio	5.7:1	5,7:1
Width	18.9 in.	480 mm
Height	30.7 in.	780 mm
Length	50.4 in.	1 279 mm
Frontal area	3.6 sq.ft.	0,33 m ²
Weight	324 lb.	147 kg
Weight/horsepower	2.16 lb./h.p.	0,98 kg/hp
Fuel consumption (cr.)	0.57 lb./h.p./hr.	260 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.39 h.p./cu.in.	23,8 hp/lit
Output/piston area	2.00 h.p./sq.in.	0,31 hp/cm ²
Piston speed (max.)	2,296 ft./min.	11,7 m/sec
B.m.e.p. (max.)	124 lb./sq.in.	8,7 kg/cm ²

Rating (take-off) 150 h.p./2,500 r.p.m.

Rating (normal) 140 h.p./2,400 r.p.m./sea level

Rating (cruising) 120 h.p./2,200 r.p.m./sea level

4P-gi: 105 h.p./1,900 r.p.m./take-off; 100 h.p./1,800 r.p.m./sea level
normal rating. Direct drive. Not supercharged. 73-octane gasoline.



Renau 6Q

Renault 6QModel **6Q-04.**

Type 6 cylinders, inverted in-line, air cooled, direct drive, supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings.

Supercharger Gear-driven 1-speed supercharger, ratio 12.3:1.

Carburation 1 Zenith updraft carburetor with automatic boost control.

Ignition 2 S.E.V. 16-1 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm²). Dry sump.

Starter Air Equipment electric starter.

Bore	4.72 in.	120 mm
Stroke	5.50 in.	140 mm
Displacement	580 cu.in.	9,5 lit
Compression ratio	6.4:1	6,4:1
Width	20.5 in.	523 mm
Height	36.6 in.	931 mm
Length	63.8 in.	1 625 mm
Frontal area	4.7 sq.ft.	0,44 m ²
Weight	564 lb.	256 kg
Weight/horsepower	2.35 lb./h.p.	1,07 kg/hp
Fuel consumption (cr.)	0.55 lb./h.p./hr.	250 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.41 h.p./cu.in.	25,3 hp/lit
Output/piston area	2.29 h.p./sq.in.	0,35 hp/cm ²
Piston speed (max.)	2,292 ft./min.	11,7 m/sec
B.m.e.p. (max.)	130 lb./sq.in.	9,1 kg/cm ²

Rating (take-off) 240 h.p./2,500 r.p.m.

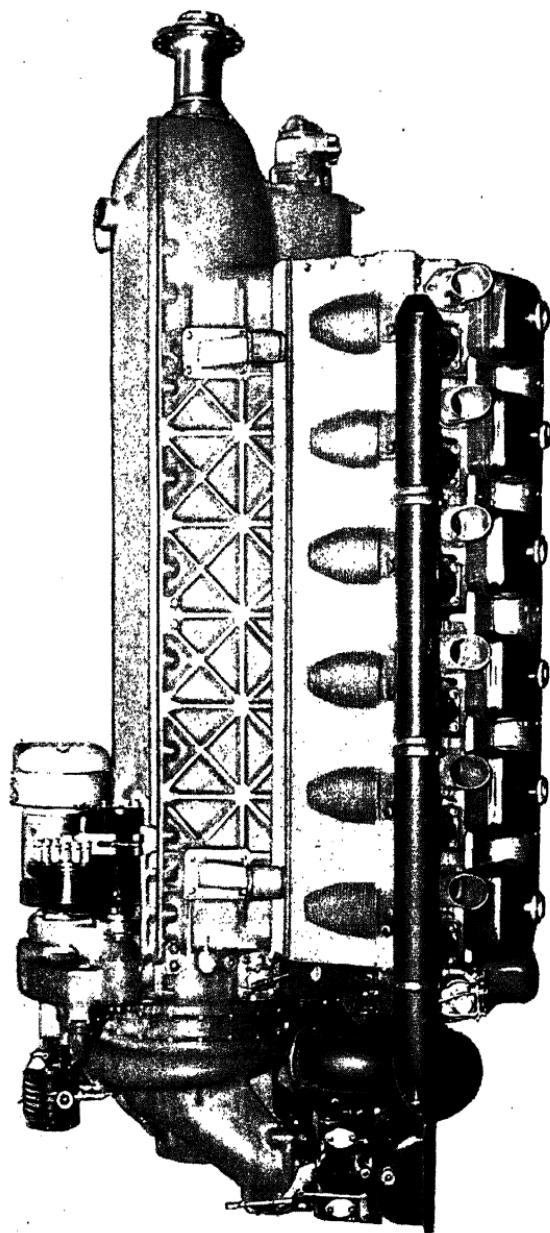
Rating (normal) 220 h.p./2,500 r.p.m./14,100 ft. (4 300 m)

Rating (cruising) 160 h.p./2,200 r.p.m./14,100 ft. (4 300 m)

6Q-02, 6Q-03: 240 h.p./2,500 r.p.m./take-off; 220 h.p./2,500 r.p.m./6,200 ft. (1 900 m) normal rating. Direct drive. 1-speed supercharger, ratio 7.6:1. 87-octane gasoline.

6Q-05: Same as 6Q-04. Propeller rotates in opposite direction.

6Q-08, 6Q-09: 240 h.p./2,500 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 87-octane gasoline.



Re. au 2R

Renault 12R

Model 12R-00.

Type 12 cylinders, inverted vee 60 degrees, air cooled, direct drive, supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings.

Supercharger Gear-driven 1-speed supercharger, ratio 11.7:1.

Carburation 1 Bronzavia updraft carburetor with automatic boost control.

Ignition 2 S.E.V. magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60 lb./sq.in. (4,0 kg/cm²). Dry sump.

Starter Air Equipment electric starter.

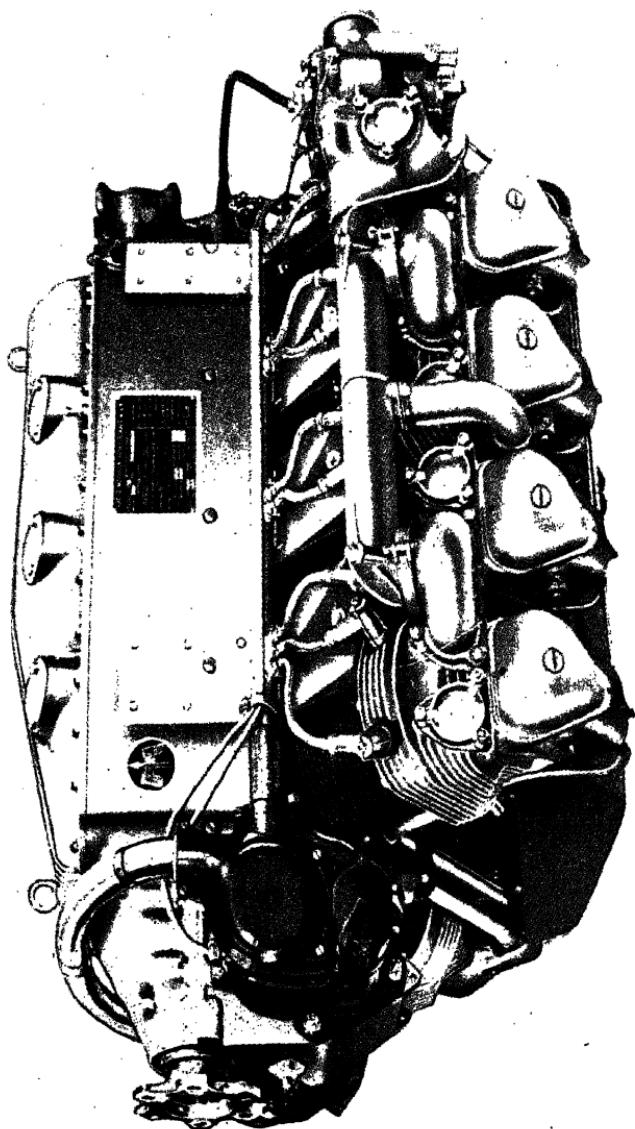
Bore	4.72 in.	120 mm
Stroke	5.50 in.	140 mm
Displacement	1,159 cu.in.	19,0 lit
Compression ratio	6.4:1	6,4:1
Width	26.8 in.	680 mm
Height	36.6 in.	929 mm
Length	81.5 in.	2 072 mm
Frontal area	4.8 sq.ft.	0,45 m ²
Weight	968 lb.	439 kg
Weight/horsepower	1.94 lb./h.p.	0,88 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.43 h.p./cu.in.	26,3 hp/lit
Output/piston area	2.38 h.p./sq.in.	0,36 hp/cm ²
Piston speed (max.)	2,296 ft./min.	11,7 m/sec
B.m.e.p. (max.)	137 lb./sq.in.	9,6 kg/cm ²

Rating (take-off) 500 h.p./2,500 r.p.m.

Rating (military) 450 h.p./2,500 r.p.m./13,100 ft. (4 000 m)

Rating (cruising) 300 h.p./2,100 r.p.m./13,100 ft. (4 000 m)

12R-01: Same as 12R-00. Propeller rotates in opposite direction.



Argus

Argus As 10Model **As 10-C3.**

Type 8 cylinders, inverted vee 90 degrees, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Sum 729 carburetor and 1 Sum 730 carburetor with mixture control.

Ignition 2 Bosch GE8-B magnetos. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45-85 lb./sq.in. (3,0 - 6,0 kg/cm²). Dry sump.

Starter Bosch electric starter.

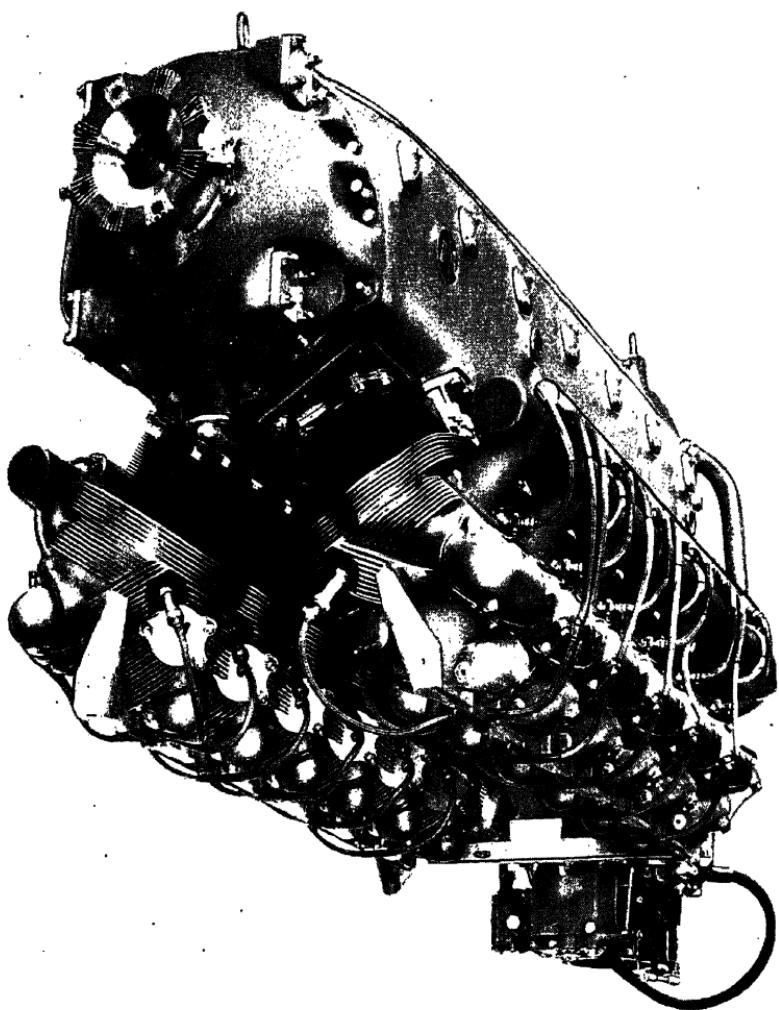
Bore	4.72 in.	129 mm
Stroke	5.50 in.	140 mm
Displacement	775 cu.in.	12,7 lit
Compression ratio	5.9:1	5,9:1
Width	34.6 in.	718 mm
Height	28.3 in.	880 mm
Length	43.3 in.	1 105 mm
Frontal area	4.1 sq.ft.	0,38 m ²
Weight	470 lb.	213 kg
Weight/horsepower	1.96 lb./h.p.	0,81 kg/hp
Fuel consumption (cr.)	0.52 lb./h.p./hr.	235 g/hp/hr
Oil consumption (cr.)	0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	100-120 S.U. sees.	20,5 - 25,1 cs
Output/displacement	0.31 h.p./cu.in.	18,9 hp/lit
Output/piston area	1.76 h.p./sq.in.	0,27 hp/cm ²
Piston speed (max.)	1,837 ft./min.	9,3 m/sec
B.m.e.p. (max.)	123 lb./sq.in.	8,6 kg/cm ²

Rating (take-off) 240 h.p./2,000 r.p.m.

Rating (normal) 220 h.p./1,940 r.p.m./sea level

Rating (cruising) 200 h.p./1,880 r.p.m./sea level

As 10-E: 270 h.p./2,100 r.p.m./take-off; 240 h.p./2,000 r.p.m./sea level normal rating. Direct drive. Not supercharged. 80-octane gasoline.**As 401:** 275 h.p./2,100 r.p.m./take-off; 270 h.p./2,050 r.p.m./9,800 ft. (3 000 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger. 87-octane gasoline.



Argus As 410

Argus As 410

Model As 410-A1.

Type 12 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece elektron crankcase with cover plate. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Planetary reduction gear, ratio 0.67:1.

Supercharger Gear-driven 1-speed supercharger, ratio 8.73:1.

Carburation 1 Argus-Hobson updraft carburetor with automatic mixture control and altitude control.

Ignition 1 Bosch ZM12-CR4 dual magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45-85 lb./sq.in. (3,0-6,0 kg/cm²). Dry sump.

Starter Bosch electric starter.

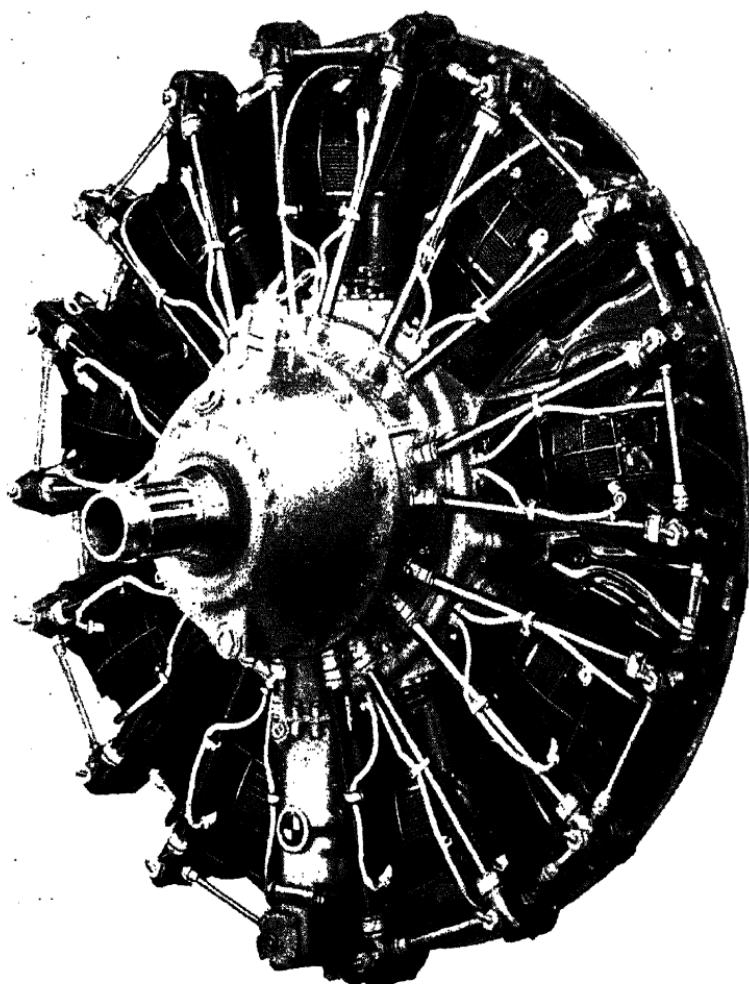
Bore	4.13 in.	105 mm
Stroke	4.53 in.	115 mm
Displacement	732 cu.in.	12,0 lit
Compression ratio	6.4:1	6,4:1
Width	26.0 in.	660 mm
Height	33.9 in.	860 mm
Length	61.8 in.	1 570 mm
Frontal area	3.9 sq.ft.	0,36 m ²
Weight	694 lb.	315 kg
Weight/horsepower	1.54 lb./h.p.	0,70 kg/hp
Fuel consumption (cr.)	0.44 lb./h.p./hr.	200 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.61 h.p./cu.in.	37,5 hp/lit
Output/piston area	2.80 h.p./sq.in.	0,43 hp/cm ²
Piston speed (max.)	2,424 ft./min.	12,3 m/sec
B.m.e.p. (max.)	152 lb./sq.in.	10,7 kg/cm ²

Rating (take-off) 450 h.p./3,210 r.p.m.

Rating (normal) 360 h.p./3,000 r.p.m./9,800 ft. (3 000 m)

Rating (cruising) 320 h.p./2,820 r.p.m./9,800 ft. (3 000 m)

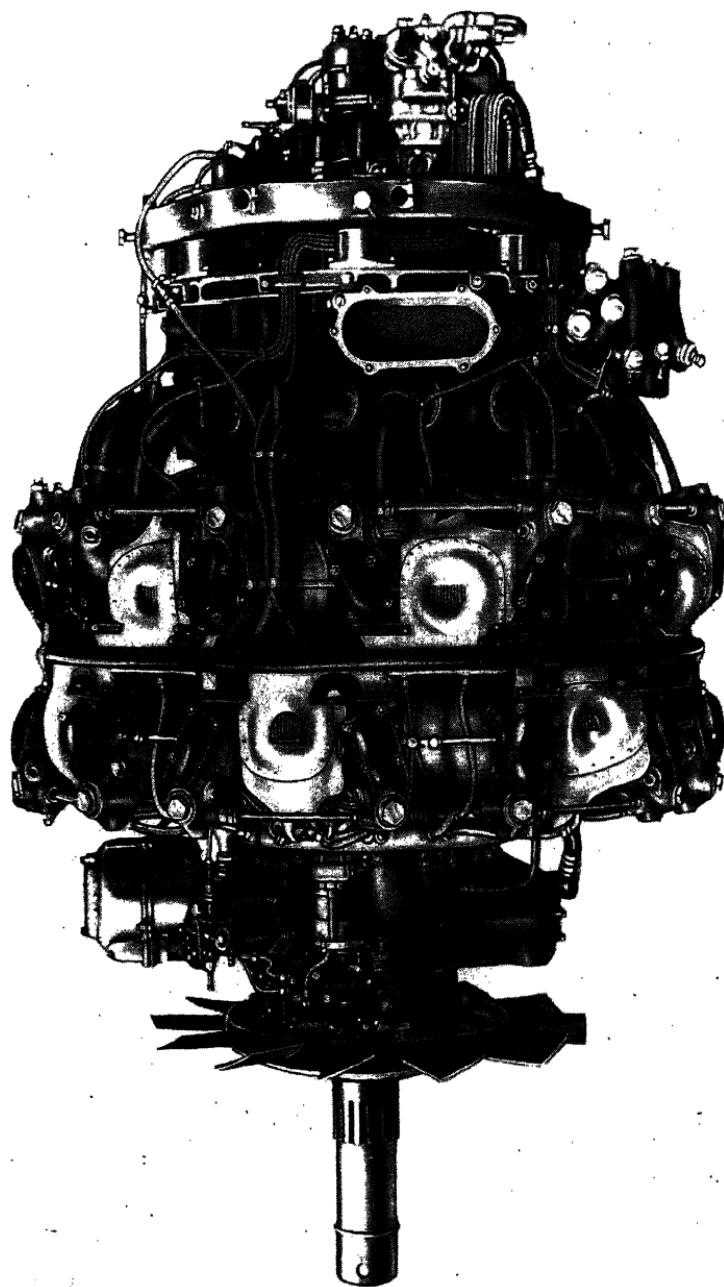
As 411: 500 h.p./3,400 r.p.m./take-off; 450 h.p./3,200 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.67:1. 1-speed supercharger. 92-octane gasoline.



B.M.W. 132

B.M.W. 132

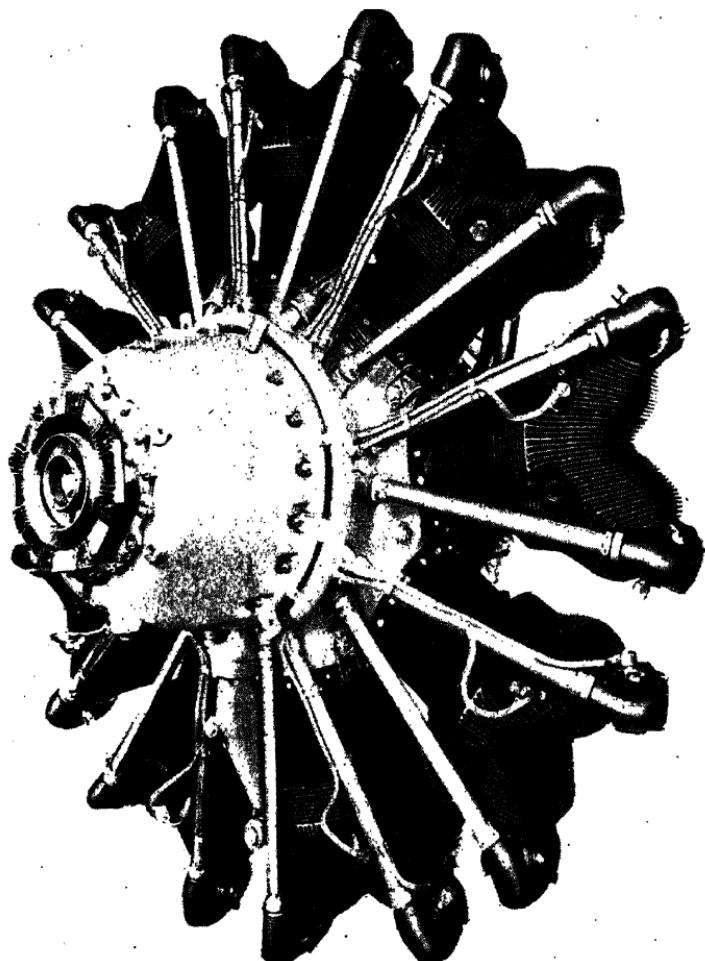
Model	132-K.	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Double planetary reduction gear, ratio 0.72:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 7.02:1. Automatic boost pressure regulator.	
Injection	Direct fuel injection. 1 Bosch 9-plunger injection pump with automatic altitude control and fuel de-aerator. 1 pintle-type injector per cylinder.	
Ignition	2 Bosch GE9-BLS magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-85 lb./sq.in. (5,0 - 6,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	6.14 in.	156 mm
Stroke	6.38 in.	162 mm
Displacement	1,690 cu.in.	27,7 lit
Compression ratio	6.9:1	6.9:1
Diameter	54.3 in.	1 380 mm
Length	48.0 in.	1 217 mm
Frontal area	16.0 sq.ft.	1,49 m ²
Weight	1,168 lb.	530 kg
Weight/horsepower	1.17 lb./h.p.	0,53 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.59 h.p./cu.in.	36,1 hp/lit
Output/piston area	3.77 h.p./sq.in.	0,58 hp/cm ²
Piston speed (max.)	2,658 ft./min.	13,5 m/sec
B.m.e.p. (max.)	187 lb./sq.in.	13,1 kg/cm ²
Rating (take-off)	1,000 h.p./2,500 r.p.m.	
Rating (normal)	960 h.p./2,450 r.p.m./9,800 ft. (3 000 m)	
Rating (cruising)	690 h.p./2,150 r.p.m./9,800 ft. (3 000 m)	
132-F:	800 h.p./2,250 r.p.m./take-off; 800 h.p./2,230 r.p.m./14,100 ft. (4 300 m) normal rating. Geared drive. 1-speed supercharger. Direct fuel injection. 87-octane gasoline.	
132-H:	1,000 h.p./2,350 r.p.m./take-off; 880 h.p./2,350 r.p.m./8,200 ft. (2 500 m) normal rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 7.87:1. Pallas NA-Y9A updraft carburetor. 87-octane gasoline.	
132-L:	800 h.p./2,250 r.p.m./take-off; 830 h.p./2,230 r.p.m./3,300 ft. (1 000 m) normal rating. Direct drive. 1-speed supercharger, ratio 7.87:1. Pallas NA-Y9A updraft carburetor. 87-octane gasoline.	
132-N:	865 h.p./2,300 r.p.m./take-off; 830 h.p./2,250 r.p.m./14,760 ft. (4 500 m) normal rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 10.14:1. Direct fuel injection. 87-octane gasoline.	



B.M.W.

B.M.W. 801

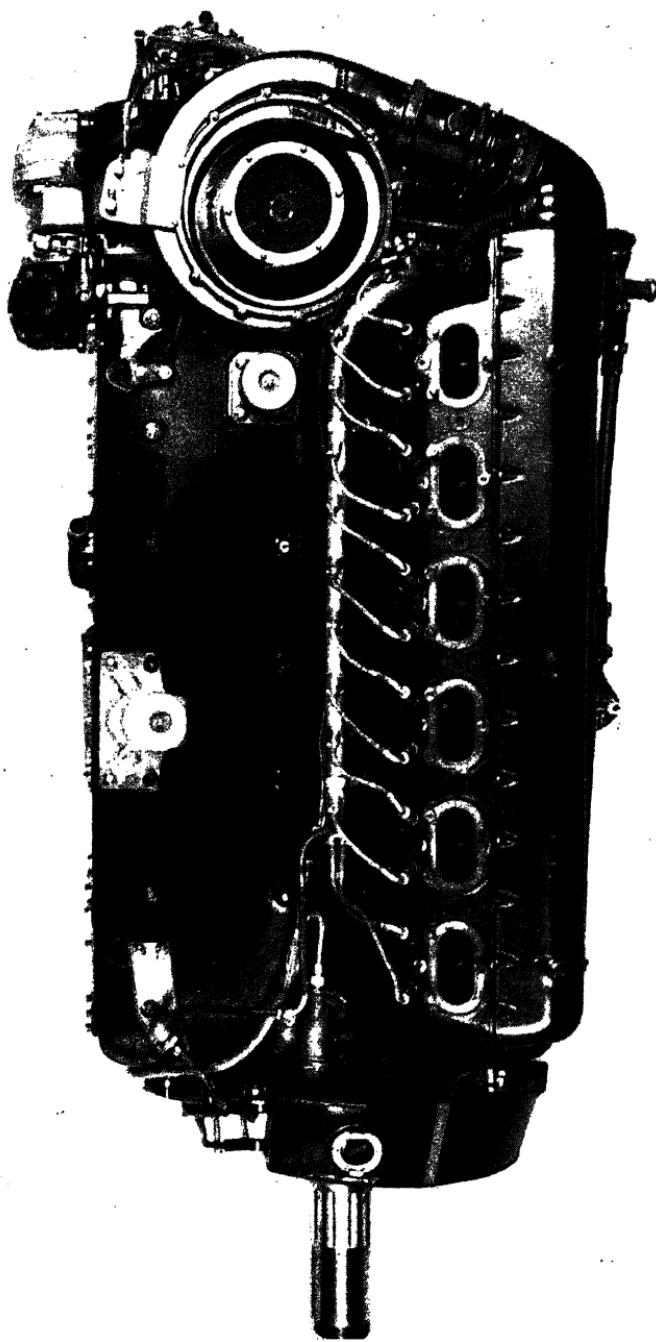
Model	801-D1.	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	3-piece steel crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 4-piece counterbalanced crankshaft supported in 2 roller bearings and 1 large central ball bearing. Planetary spur reduction gear, ratio 0.54:1. 12-blade fan 31.5 in. (800 mm) in diameter for cooling, geared 1.72 times crankshaft speed or 3.2 times propeller speed.	
Supercharger	Gear-driven 2-speed supercharger, ratios 5.07:1 and 7.46:1. Askania variable datum automatic boost control.	
Injection	Direct fuel injection. 1 Deckel 14-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 swirl-pintle type injector per cylinder.	
Ignition	1 Bosch ZM14-CR10 or ZM14-DR13 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 115-130 lb./sq.in. (8,0 - 9,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	6.14 in.	156 mm
Stroke	6.14 in.	156 mm
Displacement	2,550 cu.in.	41,8 lit
Compression ratio	6.5:1	6,5:1
Diameter	52.0 in.	1 320 mm
Length	59.1 in.	1 500 mm
Frontal area	14.7 sq.ft.	1,37 m ²
Weight	1,940 lb.	880 kg
Weight/horsepower	1.14 lb./h.p.	0.52 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.18 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.67 h.p./cu.in.	40,6 hp/lit
Output/piston area	4.00 h.p./sq.in.	0,62 hp/cm ²
Piston speed (max.)	2,763 ft./min.	14,0 m/sec
B.m.e.p. (max.)	196 lb./sq.in.	13,8 kg/cm ²
Rating (take-off)	1,700 h.p./2,700 r.p.m.	
Rating (military, low)	1,600 h.p./2,600 r.p.m./13,100 ft. (4 000 m)	
Rating (military, high)	1,600 h.p./2,500 r.p.m./19,800 ft. (6 000 m)	
Rating (cruising)	1,200 h.p./2,100 r.p.m./19,800 ft. (6 000 m)	
This engine has a maximum output of 1,700 h.p. at 23,000 ft. (7 000 m) when equipped with a 3-speed supercharger.		
801-A1:	1,580 h.p./2,700 r.p.m./take-off; 1,500 h.p./2,400 r.p.m./15,750 ft. (4 800 m) and 1,460 h.p./2,400 r.p.m./16,400 ft. (5 000 m) military rating. Reduction gear ratio 0.54:1. 2-speed supercharger, ratios 5.07:1 and 7.46:1. 87-octane gasoline. Propeller rotates clockwise.	
801-B:	Same as 801-A. Propeller rotates counter-clockwise.	
801-C:	Same as 801-A. Propeller rotates clockwise. No oil cooler.	



Bramo Fafnir 323

Bramo Fafnir 323

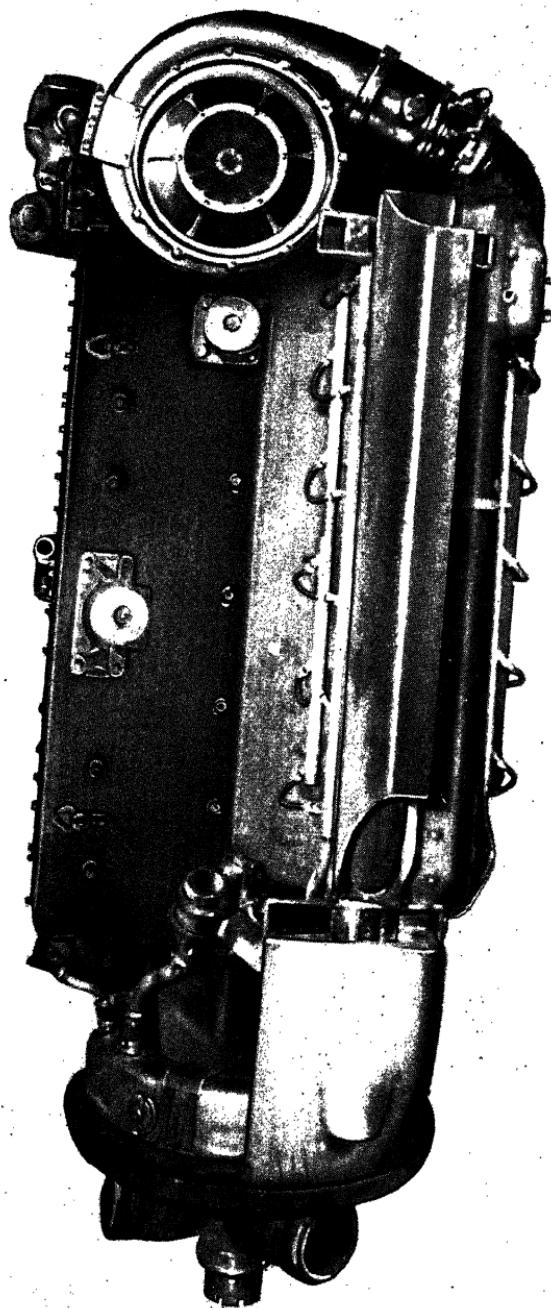
Model	Fafnir 323-P1.	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1. Equipped for V.D.M. electric-type propeller.	
Supercharger	Gear-driven 2-speed supercharger, ratios 9.6:1 and 12.4:1. Askania variable datum boost control.	
Injection	Direct fuel injection. 1 Bosch 9-plunger injection pump with automatic mixture control. Fuel de-aerator. 1 Bosch DE40N-60M-6 pintle type injector per cylinder.	
Ignition	1 Bosch ZM9-R dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 85-100 lb./sq.in. (6,0 - 7,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	6.06 in.	154 mm
Stroke	6.30 in.	160 mm
Displacement	1,636 cu.in.	26,8 lit
Compression ratio	6.23:1	6,23:1
Diameter	55.5 in.	1 410 mm
Length	67.5 in.	1 715 mm
Frontal area	16.8 sq.ft.	1,56 m ²
Weight	1,320 lb.	599 kg
Weight/horsepower	1.34 lb./h.p.	0,61 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.013 lb./h.p./hr.	6 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.60 h.p./cu.in.	36,7 hp/lit
Output/piston area	3.79 h.p./sq.in.	0,59 hp/cm ²
Piston speed (max.)	2,625 ft./min.	13,3 m/sec
B.m.e.p. (max.)	190 lb./sq.in.	13,3 kg/cm ²
Rating (take-off)	985 h.p./2,500 r.p.m./44.9 in. (1 141 mm) Hg. boost	
Rating (military, low)	810 h.p./2,500 r.p.m./8,500 ft. (2 600 m)	
Rating (military, high)	775 h.p./2,500 r.p.m./13,900 ft. (4 200 m)	
Rating (normal, low)	670 h.p./2,100 r.p.m./8,500 ft. (2 600 m)	
Rating (normal, high)	625 h.p./2,100 r.p.m./16,400 ft. (5 000 m)	
Rating (cruising)	550 h.p./2,000 r.p.m./13,900 ft. (4 200 m)	
Fafnir 323-J:	900 h.p./2,500 r.p.m./take-off; 830 h.p./2,350 r.p.m./13,800 ft. (4 200 m) military rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 11.4:1. Direct fuel injection. 87-octane gasoline.	
Fafnir 323-M:	1,000 h.p./2,500 r.p.m./take-off; 840 h.p./2,350 r.p.m./6,500 ft. (2 000 m) military rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 9.5:1. Direct fuel injection. 87-octane gasoline.	



Mer-Benz DB

Daimler-Benz DB 601

Model	DB 601-E.	
Type	12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Roller bearings in connecting rod big-ends. Spur reduction gear, ratio 0.53:1. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control. Impeller 10.2 in. (260 mm) in diameter.	
Injection	Direct fuel injection. 1 Bosch PZ12HM100-11 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch closed type 4-orifice injector per cylinder.	
Ignition	1 Bosch ZM12-BR4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	5.90 in.	150 mm
Stroke	6.30 in.	160 mm
Displacement	2,069 cu.in.	33,9 lit
Compression ratio	7.2:1	7,2:1
Width	28.0 in.	712 mm
Height	39.4 in.	1 000 mm
Length	67.7 in.	1 720 mm
Frontal area	5.4 sq.ft.	0,50 m ²
Weight	1,576 lb.	715 kg
Weight/horsepower	1.15 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.44 lb./h.p./hr.	200 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.66 h.p./cu.in.	40,6 hp/lit
Output/piston area	4.57 h.p./sq.in.	0,71 hp/cm ²
Piston speed (max.)	2,835 ft./min.	14,4 m/sec
B.m.e.p. (max.)	194 lb./sq.in.	13,6 kg/cm ²
Rating (take-off)	1,375 h.p./2,700 r.p.m./41.2 in. (1 046 mm) Hg. boost	
Rating (military)	1,375 h.p./2,700 r.p.m./18,000 ft. (5 500 m)	
Rating (max. cruising)	1,000 h.p./2,200 r.p.m./18,000 ft. (5 500 m)	
DB 601-A:	1,200 h.p./2,400 r.p.m./take-off; 1,200 h.p./2,400 r.p.m./13,500 ft. (4 100 m) military rating. Reduction gear ratio 0.53:1. Variable speed 1-stage supercharger, ratio 7.0:1 to 10.38:1. Direct fuel injection. 92-octane gasoline.	
DB 601-F1:	1,395 h.p./2,600 r.p.m./take-off; 1,400 h.p./2,600 r.p.m./19,700 ft. (6 000 m) military rating. Reduction gear ratio 0.53:1. Variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Direct fuel injection. 92-octane gasoline.	
DB 601-N:	Similar to DB 601-A. 1,200 h.p./2,600 r.p.m./take-off; 1,270 h.p./2,600 r.p.m./16,400 ft. (5 000 m) military rating.	



Daimler-Benz DB 603

Daimler-Benz DB 603

Model **DB 603-A.**

Type 12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with detachable heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 double-row roller bearings. Spur reduction gear, ratio 0.474:1 or 0.518:1.

Supercharger Gear-driven variable speed 1-stage supercharger, ratio 9.22:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control.

Injection Direct fuel injection. 1 Bosch PZ12HP120-33 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch injector per cylinder.

Ignition 1 Bosch ZM12-BR4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm²). Dry sump.

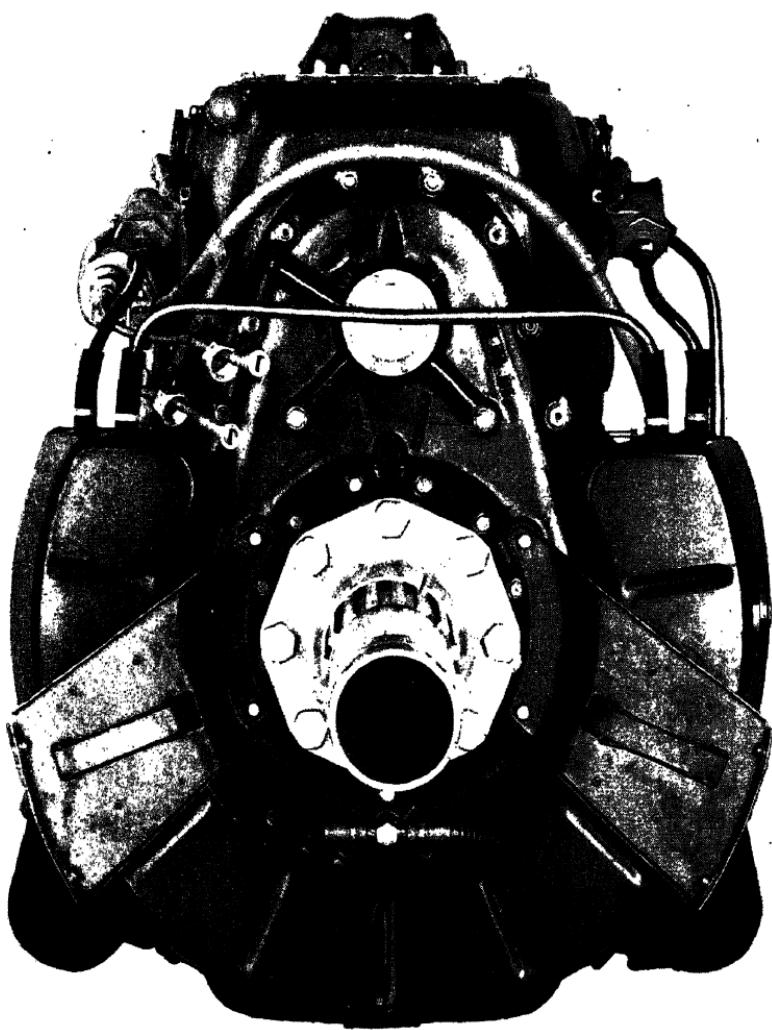
Starter Bosch electric inertia starter.

Bore	6.40 in.	162 mm
Stroke	7.10 in.	180 mm
Displacement	2,720 cu.in.	44,5 lit
Compression ratio	7.0:1	7,0:1
Width	32.0 in.	815 mm
Height	45.0 in.	1 140 mm
Length	101.0 in.	2 565 mm
Frontal area	7.0 sq.ft.	0,65 m ²
Weight	2,120 lb.	962 kg
Weight/horsepower	1.18 lb./h.p.	0,53 kg/hp
Fuel consumption (cr.)	0.44 lb./h.p./hr.	200 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.66 h.p./cu.in.	40,5 hp/lit
Output/piston area	4.66 h.p./sq.in.	0,72 hp/cm ²
Piston speed (max.)	3,195 ft./min.	16,2 m/sec
B.m.e.p. (max.)	194 lb./sq.in.	13,6 kg/cm ²

Rating (take-off) 1,800 h.p./2,700 r.p.m./41.0 in. (1 041 mm) Hg. boost

Rating (military) 1,680 h.p./2,700 r.p.m./18,000 ft. (5 500 m)

Rating (max. cruising) 1,350 h.p./2,300 r.p.m./18,000 ft. (5 500 m)



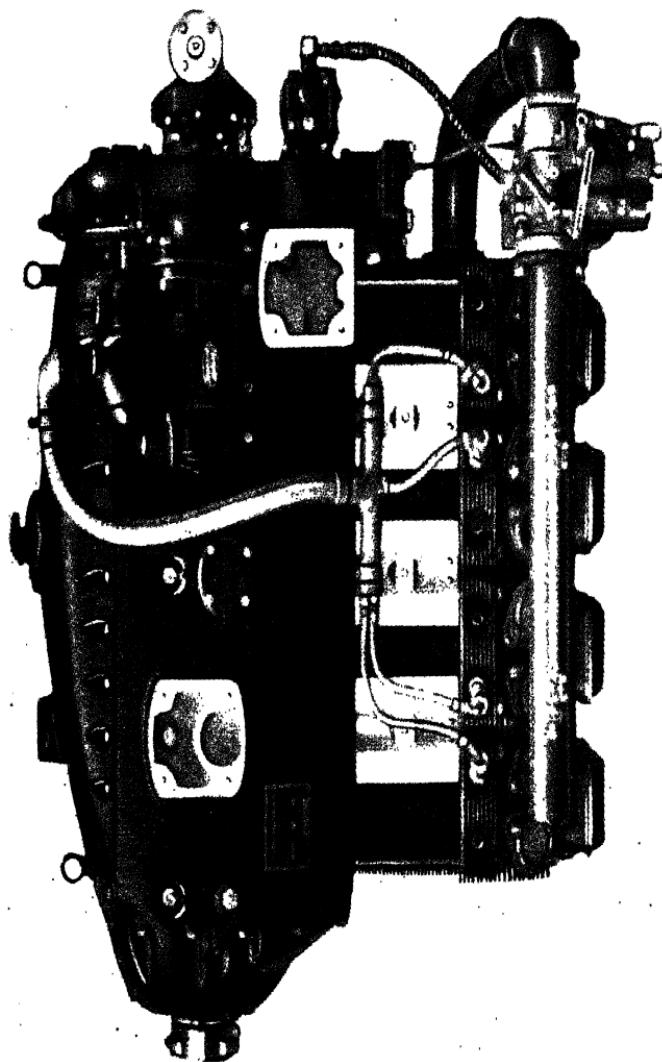
Daimler-Benz DB 605

Daimler-Benz DB 605

Model	DB 605-A1.	
Type	12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Plain bearings in connecting rod big-ends. Spur reduction gear. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control. Impeller 10.5 in. (266 mm) in diameter.	
Injection	Direct fuel injection. 1 Bosch PZ12HM112-25 12-plunger injection pump with automatic mixture control. Fuel de-aerator. 1 closed-type 6-orifice injector per cylinder.	
Ignition	1 Bosch ZM12-BR4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	6.06 in.	154 mm
Stroke	6.30 in.	160 mm
Displacement	2,180 cu.in.	35.7 lit
Compression ratio	7.2:1	7.2:1
Width	28.3 in.	720 mm
Height	39.8 in.	1 010 mm
Length	68.5 in.	1 740 mm
Frontal area	5.5 sq.ft.	0.51 m ²
Weight	1,642 lb.	745 kg
Weight/horsepower	1.09 lb./h.p.	0.49 kg/hp
Fuel consumption (cr.)	0.44 lb./h.p./hr.	200 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20.5-25.1 cs
Output/displacement	0.69 h.p./cu.in.	42.0 hp/lit
Output/piston area	4.33 h.p./sq.in.	0.67 hp/cm ²
Piston speed (max.)	2,835 ft./min.	14.4 m/sec
B.m.e.p. (max.)	202 lb./sq.in.	14.2 kg/cm ²
Rating (take-off)	1,500 h.p./2,700 r.p.m.	
Rating (military)	1,350 h.p./2,600 r.p.m./19,700 ft. (6 000 m)	
Rating (max. cruising)	1,000 h.p./2,100 r.p.m./19,700 ft. (6 000 m)	

DB 605-B1: Same as DB 605-A1, but has a different reduction gear ratio.

Note: These engines are similar to the Daimler-Benz DB 601-E in general design, but they have modified cylinder blocks and reduction gear, plain bearings in connecting rod big-ends and improved valve gear giving better cylinder scavenging.



Hirth HM 504

Hirth HM 504Model **HM 504-A2.**

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece elektron crankcase. Cover serves as oil tank. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw built-up crankshaft supported in 5 roller bearings.

Supercharger None.

Carburation 1 Pallas 40VAH carburetor with automatic mixture control.

Ignition 1 Bosch JF4-ARS48 magneto and 1 Bosch JF4-ARS49 magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm²). Dry sump.

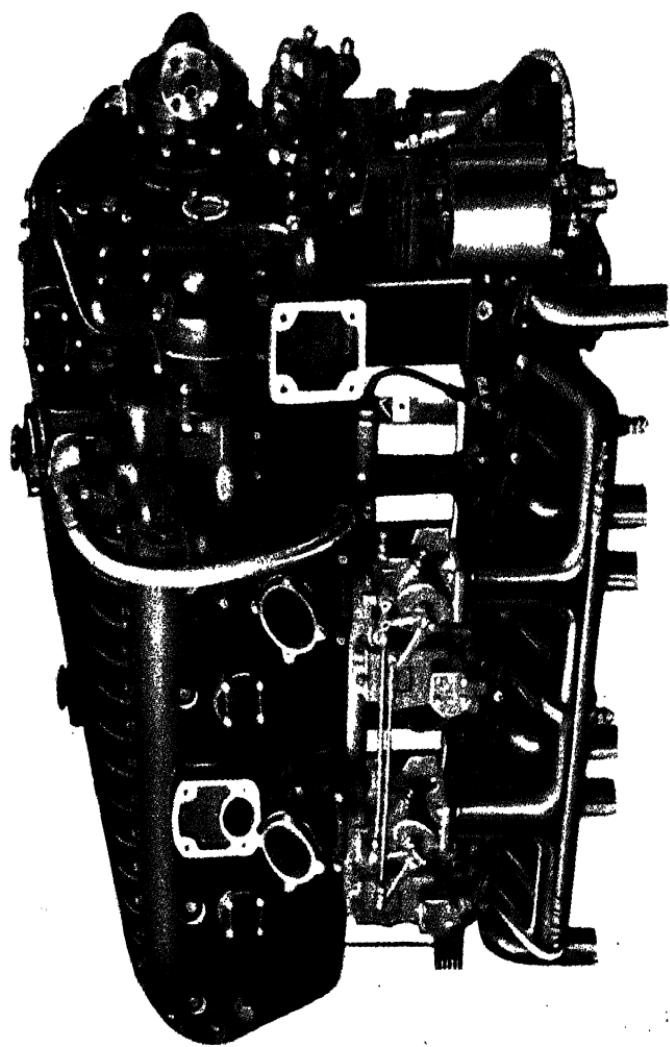
Starter Bosch hand starter.

Bore	.....	4.13 in.	105 mm
Stroke	.....	4.53 in.	115 mm
Displacement	.....	238 cu.in.	4,0 lit
Compression ratio	.....	6.0:1	6,0:1
Width	.....	19.9 in.	505 mm
Height	.....	28.7 in.	727 mm
Length	.....	37.8 in.	958 mm
Frontal area	.....	3.6 sq.ft.	0,33 m ²
Weight	.....	247 lb.	112 kg
Weight/horsepower	.....	2.35 lb./h.p.	1,07 kg/hp
Fuel consumption (cr.)	.....	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	.....	0.003 lb./h.p./hr.	1,5 g/hp/hr
Gasoline grade	.....	80 octane	80 octane
Oil grade (viscosity)	.....	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	.....	0.44 h.p./cu.in.	26,2 hp/lit
Output/piston area	.....	1.96 h.p./sq.in.	0,30 hp/cm ²
Piston speed (max.)	.....	1.96 h.p./sq.in.	9,7 m/sec
B.m.e.p. (max.)	.....	137 lb./sq.in.	9,6 kg/cm ²

Rating (take-off) 105 h.p./2,530 r.p.m.

Rating (normal) 95 h.p./2,450 r.p.m./sea level

Rating (cruising) 75 h.p./2,260 r.p.m./sea level



Hirth HM 506

Hirth HM 506Model **HM 506-A1.**

Type 6 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece elektron crankcase. Cover serves as oil tank. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw built-up crankshaft supported in 7 roller bearings.

Supercharger None.

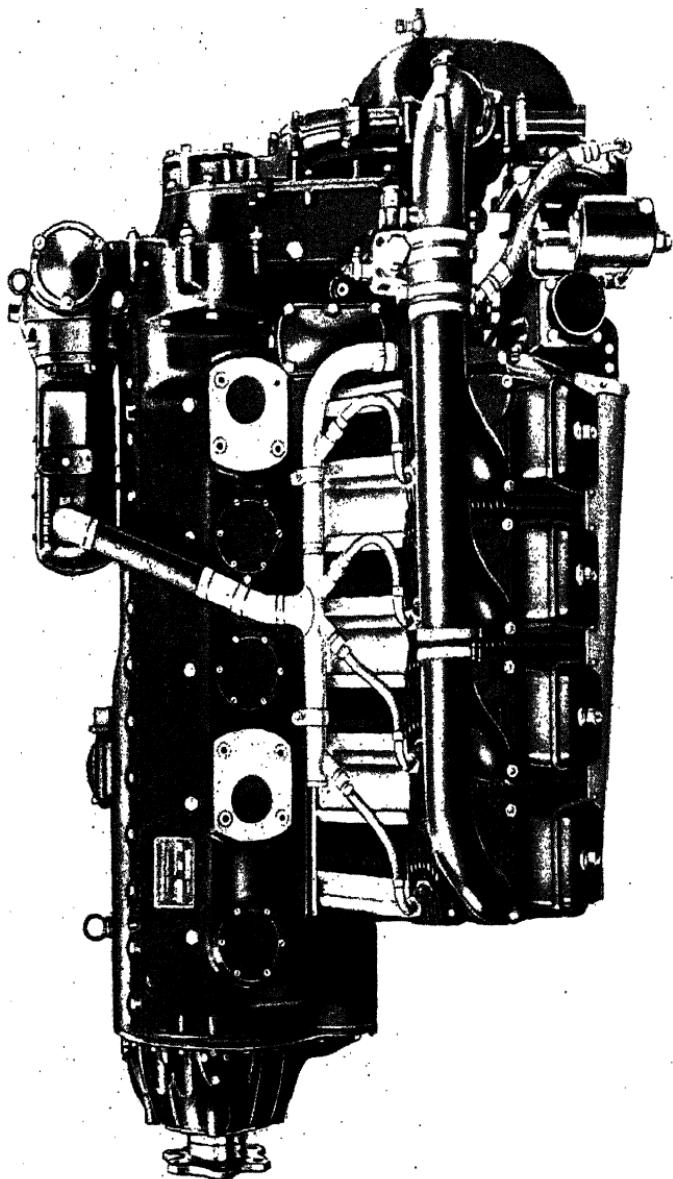
Carburation 2 Sum 713-1 downdraft carburetors with automatic mixture control.

Ignition 1 Bosch JF6-ARS48 magneto and 1 Bosch JF6-ARS49 magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm²). Dry sump.

Starter Bosch electric starter.

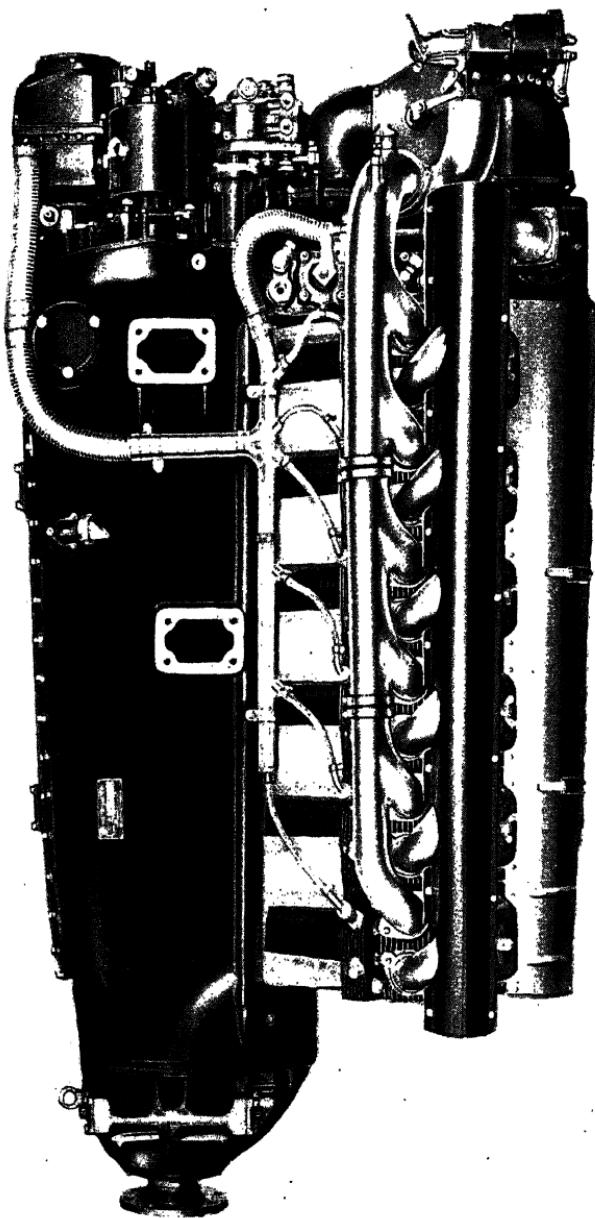
Bore	4.13 in.	105 mm
Stroke	4.53 in.	115 mm
Displacement	360 cu.in.	5,9 lit
Compression ratio	6.0:1	6,0:1
Width	19.3 in.	735 mm
Height	28.7 in.	490 mm
Length	50.4 in.	1 276 mm
Frontal area	3.5 sq.ft.	0,32 m ²
Weight	337 lb.	153 kg
Weight/horsepower	2.11 lb./h.p.	0,96 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.006 lb./h.p./hr.	3 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.44 h.p./cu.in.	27,1 hp/lit
Output/piston area	1.98 h.p./sq.in.	0,31 hp/cm ²
Piston speed (max.)	1 887 ft./min.	9,6 m/sec
B.m.e.p. (max.)	139 lb./sq.in.	9,8 kg/cm ²
Rating (take-off)	160 h.p./2,500 r.p.m.	
Rating (normal)	145 h.p./2,420 r.p.m./sea level	
Rating (cruising)	135 h.p./2,360 r.p.m./sea level	



Hirth HM 508

Hirth HM 508

Model	HM 508-D.	
Type	8 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece elektron crankcase with cover plate. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw built-up crankshaft supported in 5 roller bearings. Planetary reduction gear, ratio 0.67:1.	
Supercharger.....	Gear-driven 1-speed supercharger, ratio 4.5:1.	
Carburation.....	1 Pallas 65VAH-2 updraft carburetor with automatic mixture control and boost control. Optional equipment: 1 Sum 698B1 updraft carburetor.	
Ignition	1 Bosch ZJ-8 dual magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Bosch electric starter.	
Bore	4.13 in.	105 mm
Stroke	4.53 in.	115 mm
Displacement	482 cu.in.	8,0 lit
Compression ratio	6.0:1	6,0:1
Width	27.2 in.	686 mm
Height	32.3 in.	820 mm
Length	50.8 in.	1 290 mm
Frontal area	4.3 sq.ft.	0,40 m ²
Weight	458 lb.	208 kg
Weight/horsepower	1.64 lb./h.p.	0,74 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.006 lb./h.p./hr.	3 g/hp/hr
Gasoline grade	80 octane	80 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.58 h.p./cu.in.	35,0 hp/lit
Output/piston area	2.61 h.p./sq.in.	0,40 hp/cm ²
Piston speed (max.)	2,340 ft./min.	11,9 m/sec
B.m.e.p. (max.)	148 lb./sq.in.	10,4 kg/cm ²
Rating (take-off)	280 h.p./3,100 r.p.m.	
Rating (normal)	260 h.p./2,900 r.p.m./1,600 ft. (500 m)	
Rating (cruising)	225 h.p./2,875 r.p.m./1,600 ft. (500 m)	
HM 508-C:	300 h.p./3,000 r.p.m./take-off; 285 h.p./3,000 r.p.m./8,200 ft. (2 500 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger. 80-octane gasoline.	
HM 508-H:	240 h.p./3,000 r.p.m./take-off; 215 h.p./2,900 r.p.m./normal rating. Reduction gear ratio 0.67:1. Ground blower. 80-octane gasoline.	

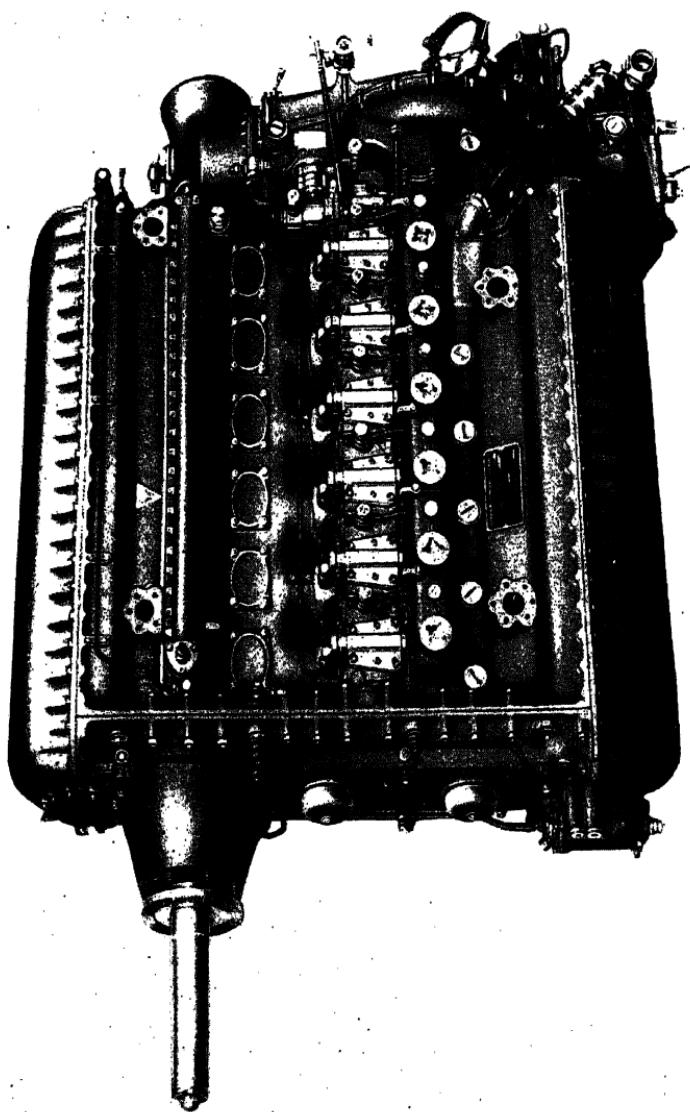


Hirth HM 512

Hirth HM 512

Model	HM 512-B.	
Type	12 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece elektron crankcase with cover plate. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw built-up counterbalanced crankshaft supported in 7 roller bearings. Planetary reduction gear, ratio 0.67:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 9.3:1.	
Carburation	2 Pallas 65VAH-2 updraft carburetors with automatic mixture control and boost control.	
Ignition	1 Bosch ZM12-BR1 dual magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5.0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	4.13 in.	105 mm
Stroke	4.53 in.	115 mm
Displacement	732 cu.in.	12,0 lit
Compression ratio	6.0:1	6,0:1
Width	27.8 in.	657 mm
Height	34.6 in.	828 mm
Length	59.4 in	1 507 mm
Frontal area	4.7 sq.ft.	0,44 m ²
Weight	606 lb.	275 kg
Weight/horsepower	1.35 lb./h.p.	0,61 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.006 lb./h.p./hr.	3 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.62 h.p./cu.in.	37,8 hp/lit
Output/piston area	2.80 h.p./sq.in.	0,43 hp/cm ²
Piston speed (max.)	2,340 ft./min.	11,9 m/sec
B.m.e.p. (max.)	158 lb./sq.in.	11,1 kg/cm ²
Rating (take-off)	450 h.p./3,100 r.p.m.	
Rating (normal)	360 h.p./3,000 r.p.m./9,800 ft. (3 000 m)	
Rating (cruising)	330 h.p./2,800 r.p.m./9,800 ft. (3 000 m)	

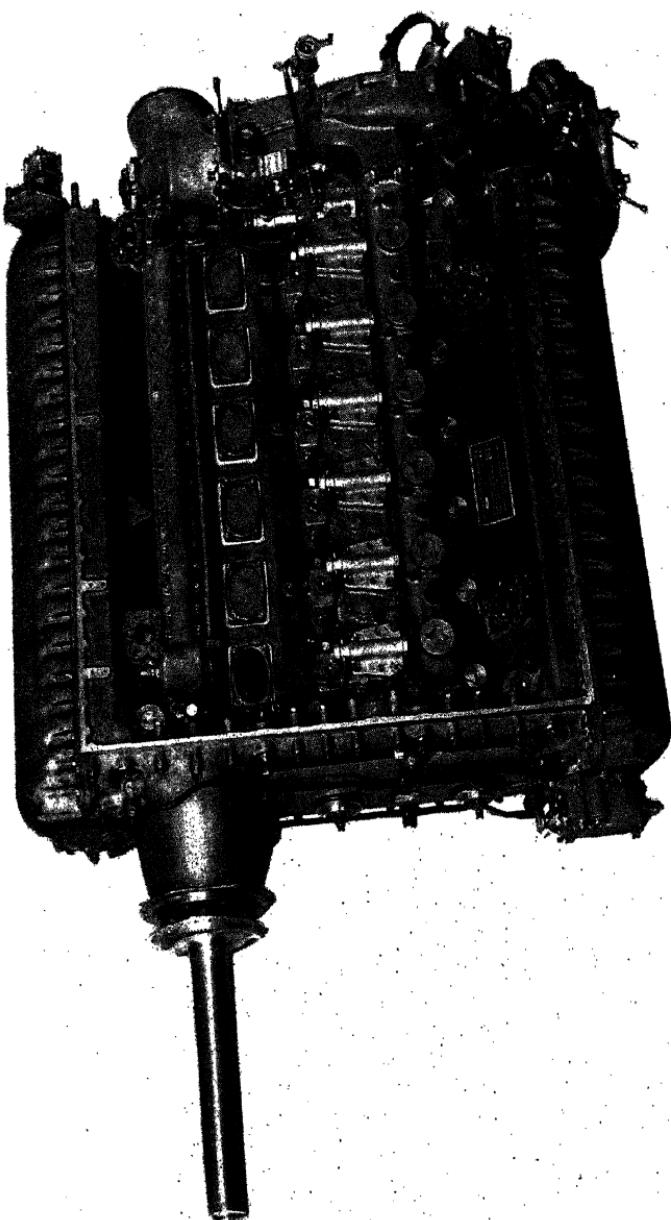
HM 512-A: 400 h.p./3,100 r.p.m./take-off; 360 h.p./3,000 r.p.m./1,600 ft. (500 m) normal rating. Reduction gear ratio 0.67:1. Ground blower. 87-octane gasoline.



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Junkers Jumo 205 (Diesel)

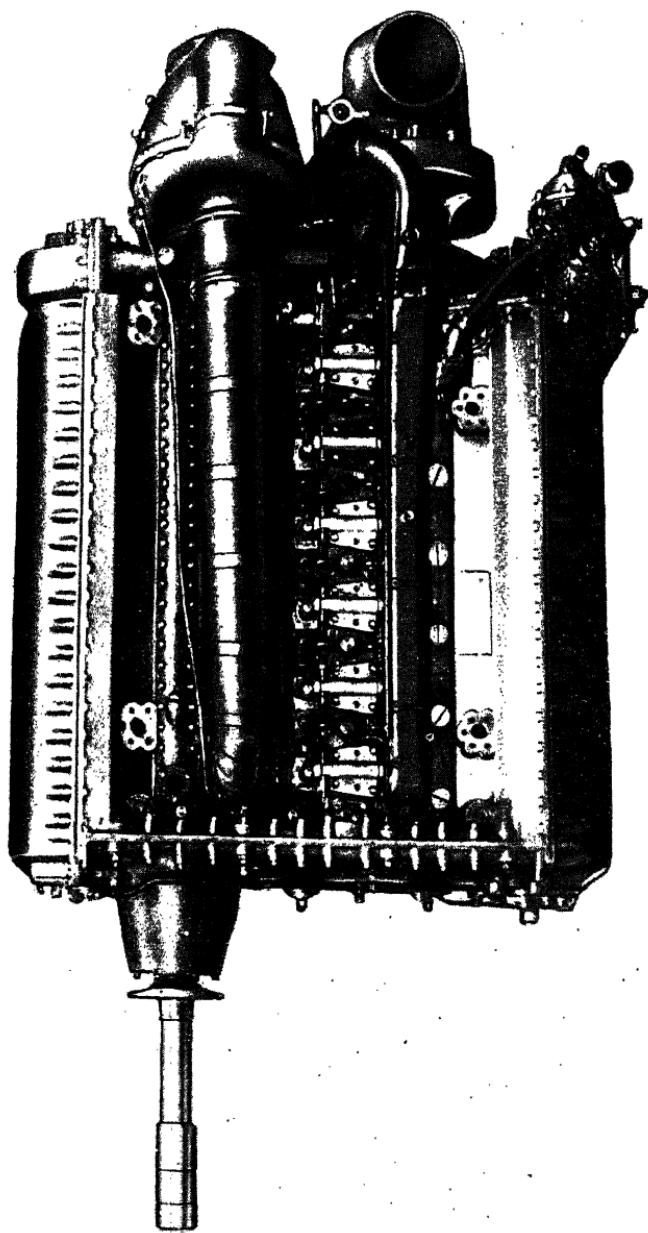
Model	Jumo 205-Ea.	
Type	6 (12) cylinders, in-line, water cooled, geared drive, ground boosted, 2-cycle.	
Construction	1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.	
Supercharger	Gear-driven 1-speed supercharger, ratio 8.9:1.	
Injection	Direct fuel injection. 2 Junkers 1-plunger injection pumps and 4 Junkers open-type 2-orifice injectors per cylinder. Injection pressure 8,500 lb./sq.in. (600 kg/cm ²).	
Ignition	Compression.	
Lubrication	Pressure feed, 55-70 lb./sq.in. (4.0 - 5.0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	4.13 in.	105 mm
Stroke	2 x 6.30 in.	2 x 160 mm
Displacement	1,014 cu.in.	16,6 lit
Compression ratio	17.0:1	17,0:1
Width	23.6 in.	600 mm
Height	52.2 in.	1 325 mm
Length	80.0 in.	2 051 mm
Frontal area	7.5 sq.ft.	0.70 m ²
Weight	1,257 lb.	570 kg
Weight/horsepower	1.79 lb./h.p.	0.81 kg/hp
Fuel consumption (cr.)	0.35 lb./h.p./hr.	160 g/hp/hr
Oil consumption (cr.)	0.013 lb./h.p./hr.	6 g/hp/hr
Fuel oil grade	50 to 60 cetane	50 to 60 cetane
Lub. oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.69 h.p./cu.in.	42,1 hp/lit
Output/piston area	4.35 h.p./sq.in.	0.67 hp/cm ²
Piston speed (max.)	2,625 ft./min.	13,3 m/sec
B.m.e.p. (max.)	109 lb./sq.in.	7,7 kg/cm ²
Rating (take-off)	700 h.p./2,500 r.p.m.	
Rating (normal)	650 h.p./2,500 r.p.m./8,200 ft. (2 500 m)	
Rating (cruising)	560 h.p./2,060 r.p.m./8,200 ft. (2 500 m)	
Jumo 205-C:	600 h.p./2,200 r.p.m./take-off; 550 h.p./2,100 r.p.m./8,200 ft. (2 500 m) normal rating. Reduction gear ratio 0.73:1. 1-speed supercharger, ratio 7.0:1. Direct fuel injection. 50 to 60 cetane fuel oil.	
Jumo 205-D:	880 h.p./3,000 r.p.m./take-off; 850 h.p./3,000 r.p.m./9,800 ft. (3 000 m) normal rating. Reduction gear ratio 0.61:1. 1-speed supercharger, ratio 8.0:1. Direct fuel injection. 50 to 60 cetane fuel oil.	



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Junkers Jumo 206 (Diesel)

Model	Jumo 206.	
Type	6 (12) cylinders, in-line, water cooled, geared drive, supercharged, 2-cycle.	
Construction	1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.	
Supercharger	Gear-driven 1-speed supercharger, ratio 8.0:1.	
Injection	Direct fuel injection. 2 Junkers 1-plunger injection pumps and 4 Junkers open-type 2-orifice injectors per cylinder. Injection pressure 8,500 lb./sq.in. (600 kg/cm ²).	
Ignition	Compression.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.	
Bore	5.12 in.	130 mm
Stroke	2 x 6.30 in.	2 x 160 mm
Displacement	1,556 cu.in.	25,5 lit
Compression ratio	18.0:1	18,0:1
Width	27.6 in.	700 mm
Height	52.8 in.	1 340 mm
Length	89.0 in.	2 260 mm
Frontal area	8.6 sq.ft.	0,80 m ²
Weight	1,654 lb.	750 kg
Weight/horsepower	1.38 lb./h.p.	0,62 kg/hp
Fuel consumption (cr.)	0.35 lb./h.p./hr.	160 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Fuel oil grade	50 to 60 cetane	50 to 60 cetane
Lub. oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.77 h.p./cu.in.	47,1 hp/lit
Output/piston area	4.85 h.p./sq.in.	0,75 hp/cm ²
Piston speed (max.)	2,730 ft./min.	13,9 m/sec
B.m.e.p. (max.)	117 lb./sq.in.	8,2 kg/cm ²
Rating (take-off)	1,200 h.p./2,600 r.p.m.	
Rating (normal)	1,000 h.p./2,400 r.p.m./9,800 ft. (3 000 m)	
Rating (cruising)	850 h.p./2,000 r.p.m./9,800 ft. (3 000 m)	
Jumo 208:	1,500 h.p./3,000 r.p.m./take-off; 1,500 h.p./3,000 r.p.m./26,000 ft. (8 000 m) military rating. Geared drive. 1-speed supercharger, ratio 8.0:1. Turbo-supercharger. Direct fuel injection. 50 to 60 cetane fuel oil.	



Pratt & Whitney 207

Junkers Jumo 207 (Diesel)Model **Jumo 207-A.**

Type 6 (12) cylinders, in-line, water cooled, geared drive, supercharged, 2-cycle.

Construction 1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.

Supercharger Gear-driven 1-speed supercharger, ratio 8.0:1. Turbo-supercharger.

Injection Direct fuel injection. 2 Junkers 1-plunger injection pumps and 4 Junkers open-type 2-orifice injectors per cylinder. Injection pressure 8,500 lb./sq.in. (600 kg/cm²).

Ignition Compression.

Lubrication Pressure feed, 55-70 lb./sq.in. (4,0-5,0 kg/cm²). Dry sump.

Starter Bosch electric inertia starter.

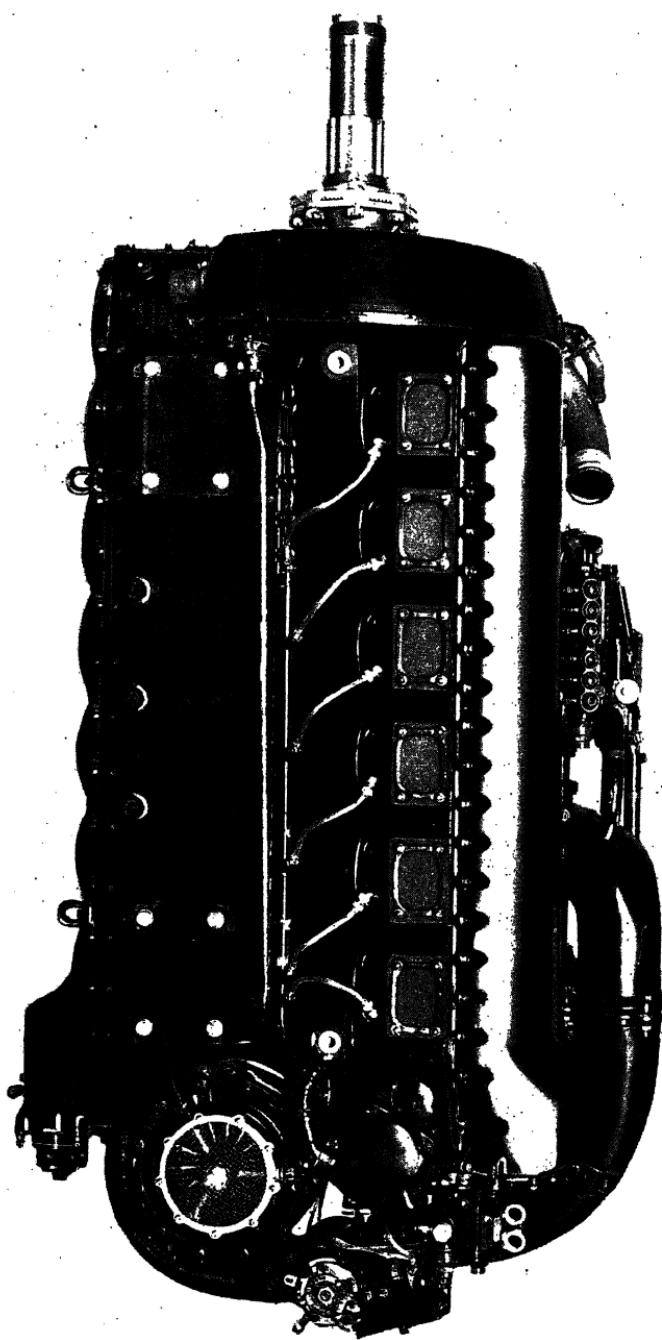
Bore	.....	4.13 in.	105 mm
Stroke	.....	2 x 6.30 in.	2 x 160 mm
Displacement	.....	1,014 cu.in.	16,6 lit
Compression ratio	.....	18.0:1	18,0:1
Width	.....	28.3 in.	720 mm
Height	.....	52.2 in.	1 325 mm
Length	.....	86.0 in.	2 150 mm
Frontal area	.....	8.7 sq.ft.	0,81 m ²
Weight	.....	1,430 lb.	650 kg
Weight/horsepower	.....	1.43 lb./h.p.	0,65 kg/hp
Fuel consumption (cr.)	....	0.37 lb./h.p./hr.	170 g/hp/hr
Oil consumption (cr.)	....	0.018 lb./h.p./hr.	8 g/hp/hr
Fuel oil grade	.....	50 to 60 cetane	50 to 60 cetane
Lub. oil grade (viscosity)	.....	100 S.U. secs.	20,5 cs
Output/displacement	....	0.99 h.p./cu.in.	60,1 hp/lit
Output/piston area	....	6.22 h.p./sq.in.	0,96 hp/cm ²
Piston speed (max.)	....	3,150 ft./min.	16,0 m/sec
B.m.e.p. (max.)	.....	131 lb./sq.in.	9,2 kg/cm ²

Rating (take-off) 1,000 h.p./3,000 r.p.m.

Rating (military) 1,000 h.p./3,000 r.p.m./32,800 ft. (10 000 m)

Rating (normal) 950 h.p./2,800 r.p.m./32,800 ft. (10 000 m)

Rating (max. cruising) 880 h.p./2,500 r.p.m./32,800 ft. (10 000 m)



Pratt & Whitney R-1830

Junkers Jumo 211**Model Jumo 211-J.**

Type 12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece silumin crankcase with 2 integral cylinder blocks. Detachable cylinder heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1 piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.65:1. Hollow propeller shaft for cannon.

Supercharger Gear-driven 2 speed supercharger, ratios 7.95:1 and 11.37:1. Automatic boost pressure regulator. Intercooler.

Injection Direct fuel injection. 1 Junkers 12 plunger injection pump with automatic mixture control. Fuel de-aerator. 1 Junkers closed type swirl injector per cylinder.

Ignition 2 Bosch GE12BRS magnetos. 2 11 mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-90 lb. sq.in. (5.0-6.0 kg. cm²). Dry sump.

Starter Bosch electric inertia starter.

Bore	5.90 in.	150 mm
Stroke	6.50 in.	165 mm
Displacement	2,136 cu.in.	35.0 lit
Compression ratio	7.0:1	7.0:1
Width	31.5 in.	1 030 mm
Height	41.3 in.	804 mm
Length	69.7 in.	1 769 mm
Frontal area	6.3 sq.ft.	0.58 m ²
Weight	1,429 lb.	648 kg
Weight/horsepower	1.06 lb./h.p.	0.48 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p. hr.	205 g/hp hr
Oil consumption (cr.)	0.018 lb./h.p. hr.	8 g/hp hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100 S.U. sec.	20.5 cs
Output/displacement	0.63 h.p./cu.in.	38.6 hp/lit
Output/piston area	4.10 h.p./sq.in.	0.63 hp/cm ²
Piston speed (max.)	2,817 ft./min.	14.3 m/sec
B.m.e.p. (max.)	191 lb./sq.in.	13.4 kg/cm ²

Rating (take-off) 1,350 h.p./2,600 r.p.m.

Rating (military, low) 1,300 h.p./2,500 r.p.m./12,500 ft. (3 800 m)

Rating (military, high) 1,260 h.p./2,500 r.p.m./16,400 ft. (5 000 m)

Rating (max. cruising) 1,000 h.p./2,200 r.p.m./16,400 ft. (5 000 m)

Jumo 211-A1: 1,200 h.p./2,300 r.p.m./take off; 1,025 h.p./2,300 r.p.m. 16,000 ft. (1 700 m) and 975 h.p./2,300 r.p.m./13,800 ft. (4 200 m) military rating. Reduction gear ratio 0.65:1. 2 speed supercharger, ratios 7.95:1 and 11.37:1. Direct fuel injection, 92 octane gasoline.

Jumo 211-B1: 1,200 h.p./2,400 r.p.m./take off; 1,200 h.p. 2,400 r.p.m. 3,300 ft. (1 000 m) and 1,050 h.p./2,400 r.p.m./13,000 ft. (4 000 m) military rating. Reduction gear ratio 0.60:1. 2 speed supercharger, ratios 7.95:1 and 11.37:1. Direct fuel injection, 92 octane gasoline.

Jumo 211-D1: Similar to Jumo 211-B1. Reduction gear ratio 0.65:1.

Jumo 211-F1: Similar to Jumo 211-J. No intercooler.



Pratt & Whitney R-2850

Junkers Jumo 213

Model **Jumo 213-A.**

Type 12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece silumin crankcase with 2 integral cylinder blocks. Detachable cylinder heads for each block. Steel cylinder liners. 2 inlet valves and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear. Hollow propeller shaft for cannon.

Supercharger Gear-driven 2-speed supercharger. Automatic boost pressure regulator and intercooler.

Injection Direct fuel injection. 1 Junkers 12-plunger injection pump with automatic mixture control. Fuel de-aerator. 1 closed-type multi-orifice injector per cylinder.

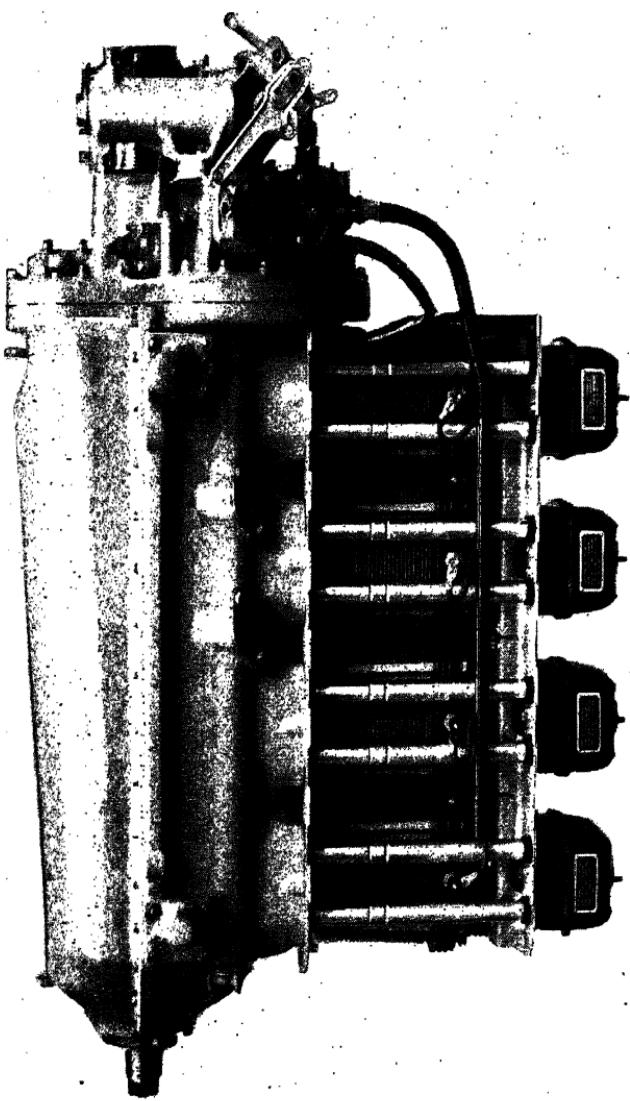
Ignition 2 Bosch magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-90 lb./sq.in. (5,0 - 6,0 kg/cm²). Dry sump.

Starter Bosch electric inertia starter.

Bore	6.06 in.	154 mm
Stroke	6.50 in.	165 mm
Displacement	2,250 cu.in.	36,9 lit
Compression ratio	7.0:1	7,0:1
Width	31.9 in.	1 060 mm
Height	41.3 in.	810 mm
Length	70.9 in.	1 800 mm
Frontal area	6.3 sq.ft.	0,58 m ²
Weight	1,543 lb.	700 kg
Weight/horsepower	0.91 lb./h.p.	0,41 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.76 h.p./cu.in.	46,1 hp/lit
Output/piston area	4.91 h.p./sq.in.	0,76 hp/cm ²
Piston speed (max.)	2,925 ft./min.	14,8 m/sec
B.m.e.p. (max.)	223 lb./sq.in.	15,7 kg/cm ²
Rating (take-off)	1,700 h.p./2,700 r.p.m.	
Rating (normal, low)	1,700 h.p./2,700 r.p.m./9,800 ft. (3 000 m)	
Rating (normal, high)	1,500 h.p./2,700 r.p.m./19,800 ft. (6 000 m)	
Rating (cruising)	1,200 h.p./2,200 r.p.m./19,700 ft. (6 000 m)	

Note: This engine is similar to the Junkers Jumo 211 in general design, except that it has a slightly larger bore giving it a greater displacement.



Alfa Romeo Alfa

Alfa Romeo Alfa 110

Model Alfa 110-1.

Type 4 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 2-piece elektron crankcase. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crank-shaft supported in 5 plain bearings.

Supercharger None.

Carburation 1 Mona-Hobson AI48D downdraft carburetor with mixture control.

Ignition 2 Marelli SA4 magnetos. 2 14-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 40-45 lb./sq.in. (2,8-3,2 kg/cm²). Dry sump.

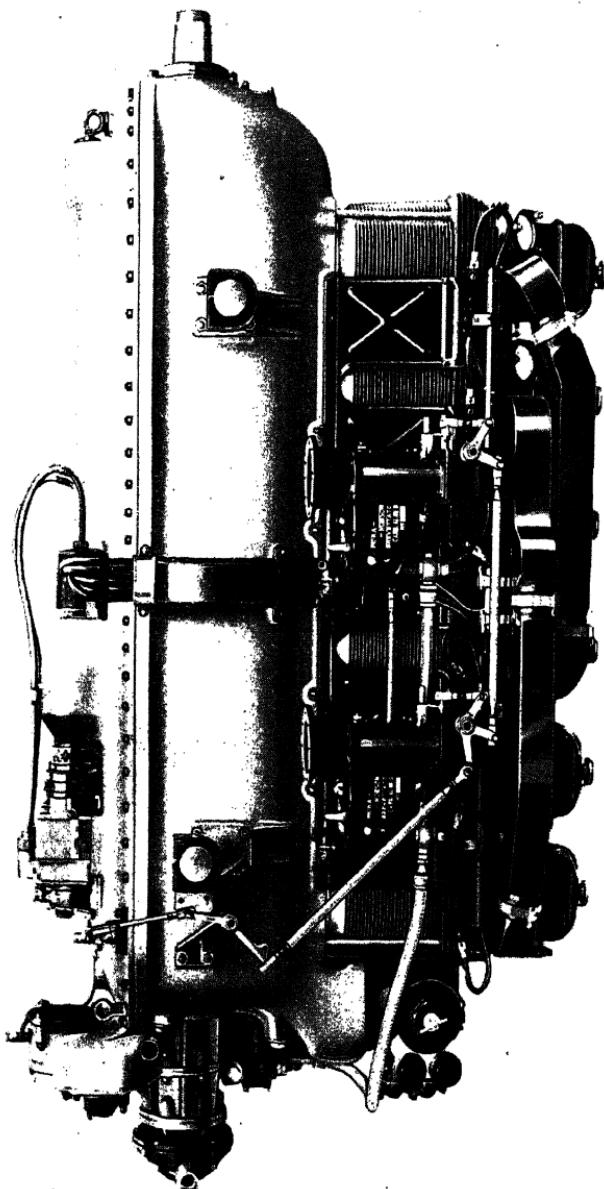
Starter Hand starter.

Bore	4.65 in.	118 mm
Stroke	5.50 in.	140 mm
Displacement	374 cu.in.	6,1 lit
Compression ratio	5.55:1	5,55:1
Width	20.0 in.	508 mm
Height	31.0 in.	787 mm
Length	48.3 in.	1 227 mm
Frontal area	3.9 sq.ft.	0,36 m ²
Weight	300 lb.	136 kg
Weight/horsepower	2.31 lb./h.p.	1,05 kg/hp
Fuel consumption (cr.)	0.53 lb./h.p./hr.	240 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.35 h.p./cu.in.	21,3 hp/lit
Output/piston area	1.91 h.p./sq.in.	0,30 hp/cm ²
Piston speed (max.)	2,158 ft./min.	11,0 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	9,0 kg/cm ²

Rating (take-off) 130 h.p./2,350 r.p.m.

Rating (normal) 120 h.p./2,100 r.p.m./sea level

Rating (cruising) 90 h.p./1,500 r.p.m./sea level



COURTESY AEROSPHERE

Alfa Romeo Alta 115

Alfa Romeo Alfa 115Model **Alfa 115-1.**

Type 6 cylinders, inverted in-line, air cooled, direct drive, not supercharged, 4-cycle.

Construction 1-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings.

Supercharger None.

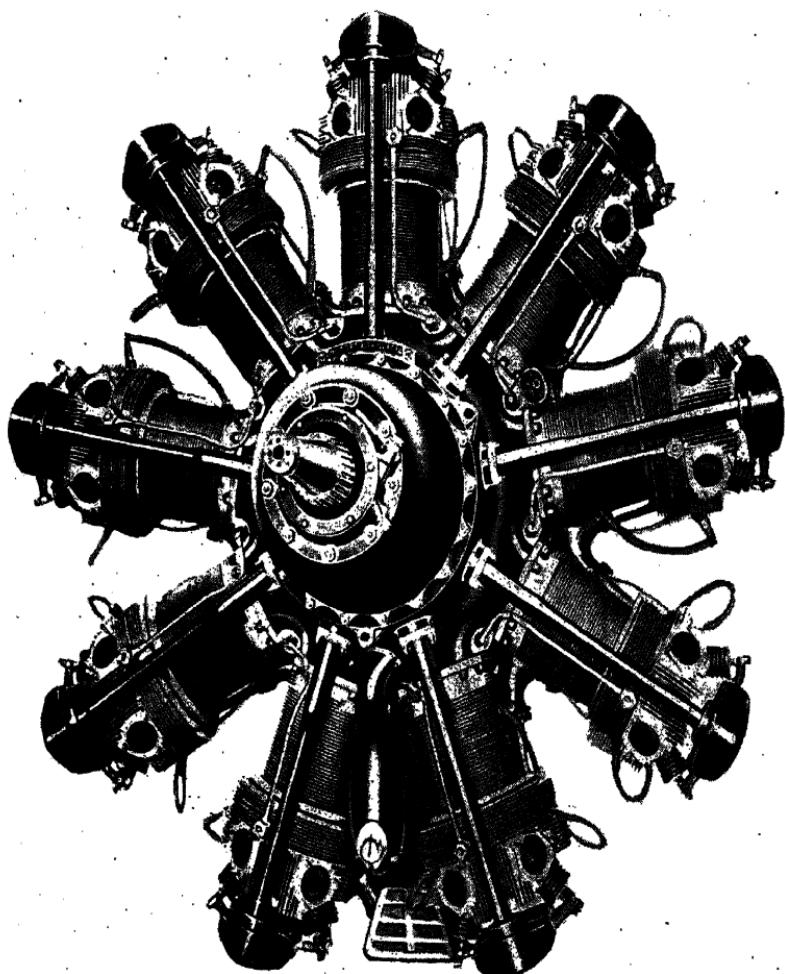
Carburation 2 Mona-Holson AI48D downdraft carburetors with mixture control.

Ignition 2 Marelli magnetos. 2 14-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 40-45 lb./sq.in. (2,8-3,2 kg/cm²). Dry sump.

Starter Hand starter.

Bore	4.65 in.	118 mm
Stroke	5.50 in.	140 mm
Displacement	560 cu.in.	9,2 lit
Compression ratio	5.5:1	5,5:1
Width	19.1 in.	485 mm
Height	31.7 in.	805 mm
Length	60.7 in.	1 542 mm
Frontal area	3.8 sq.ft.	0,35 m ²
Weight	463 lb.	210 kg
Weight/horsepower	2.26 lb./h.p.	1,02 kg/hp
Fuel consumption (cr.)	0.53 lb./h.p./hr.	240 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	73 octane	73 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.37 h.p./cu.in.	23,3 hp/lit
Output/piston area	2.01 h.p./sq.in.	0,31 hp/cm ²
Piston speed (max.)	2,158 ft./min.	11,0 m/sec
B.m.e.p. (max.)	125 lb./sq.in.	8,8 kg/cm ²
Rating (take-off)	205 h.p./2,350 r.p.m.	
Rating (normal)	195 h.p./2,200 r.p.m./sea level	
Rating (cruising)	140 h.p./1,500 r.p.m./sea level	



Alfa Romeo Alfa 128

Alfa Romeo Alfa 128Model **Alfa 128-RC21.**

Type 9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods, 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.65:1.

Supercharger Gear-driven 1-speed supercharger, ratio 8.8:1.

Carburation 1 Mona-Hobson AVT85MC updraft carburetor with automatic boost control.

Ignition 2 Marelli MF9 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

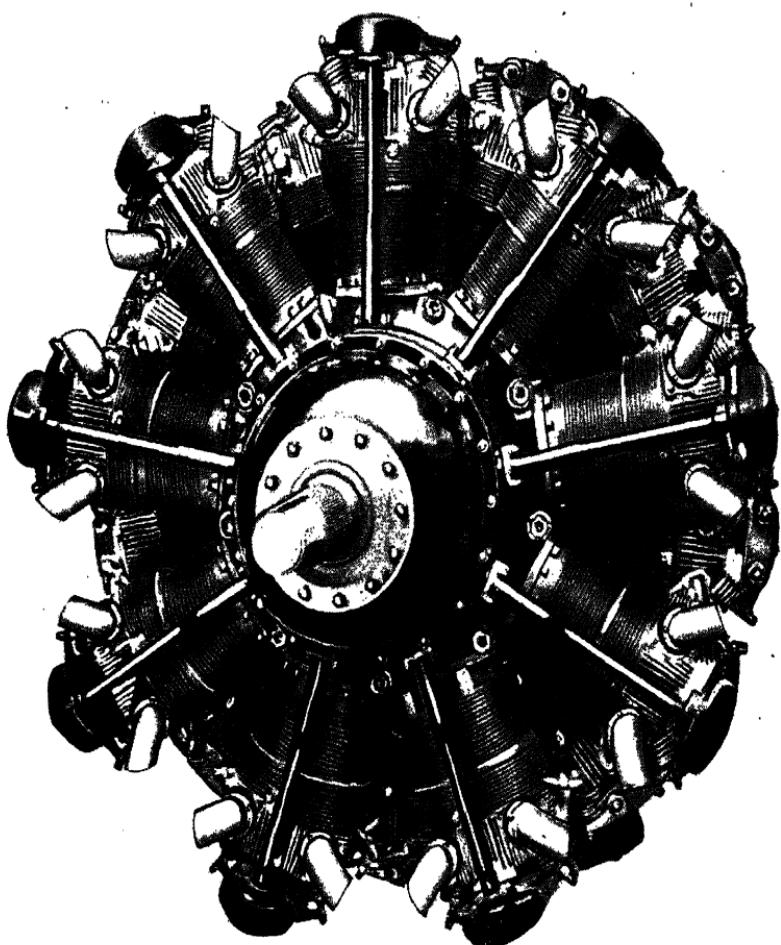
Bore	5.75 in.	146 mm
Stroke	7.50 in.	190 mm
Displacement	1,746 cu.in.	28,6 lit
Compression ratio	7.0:1	7,0:1
Diameter	55.1 in.	1 400 mm
Length	52.3 in.	1 329 mm
Frontal area	16.6 sq.ft.	1,54 m ²
Weight	1,138 lb.	516 kg
Weight/horsepower	1.20 lb./h.p.	0,54 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	0.013 lb./h.p./hr.	6 g/hp/hr
Gasoline grade	.87 octane	87 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.54 h.p./cu.in.	33,2 hp/lit
Output/piston area	4.06 h.p./sq.in.	0,63 hp/cm ²
Piston speed (max.)	2,867 ft./min.	14,6 m/sec
B.m.e.p. (max.)	186 lb./sq.in.	13,1 kg/cm ²

Rating (take-off) 950 h.p./2,300 r.p.m./39.4 in. (1 000 mm) Hg. boost

Rating (military) 860 h.p./2,300 r.p.m./6,900 ft. (2 100 m)

Rating (cruising) 660 h.p./1,800 r.p.m./8,200 ft. (2 500 m)

Alfa 126-RC10: 850 h.p./2,300 r.p.m./take-off; 800 h.p./2,300 r.p.m./3,300 ft. (1 000 m) military rating. Geared drive. 1-speed supercharger, ratio 7.0:1. 87-octane gasoline.**Alfa 126-RC34:** 780 h.p./2,300 r.p.m./take-off; 780 h.p./2,300 r.p.m./11,500 ft. (3 500 m) military rating. Reduction gear ratio 0.65:1. 1-speed supercharger, ratio 10.0:1. 87-octane gasoline.



Alfa Romeo Alfa 135

Alfa Romeo Alfa 135

Model Alfa 135-RC32.

Type 18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.

Supercharger Gear-driven 1-speed supercharger, ratio 9.26:1.

Carburation 1 Zenith-Stromberg NA-Z160RGSL updraft carburetor with automatic mixture control and boost control.

Ignition 2 Marelli MF18 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

Bore	5.75 in.	146 mm
Stroke	6.30 in.	160 mm
Displacement	2,940 cu.in.	48,2 lit
Compression ratio	6.6:1	6,6:1
Diameter	51.6 in.	1 315 mm
Length	70.5 in.	1 788 mm
Frontal area	14.5 sq.ft.	1,35 m ²
Weight	2,094 lb.	950 kg
Weight/horsepower	1.29 lb./h.p.	0,59 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.55 h.p./cu.in.	33,6 hp/lit
Output/piston area	3.47 h.p./sq.in.	0,52 hp/cm ²
Piston speed (max.)	2,520 ft./min.	12,8 m/sec
B.m.e.p. (max.)	181 lb./sq.in.	12,7 kg/cm ²

Rating (take-off) 1,620 h.p./2,400 r.p.m.

Rating (military) 1,400 h.p./2,400 r.p.m./10,500 ft. (3 200 m)

Rating (cruising) 1,100 h.p./1,900 r.p.m./13,100 ft. (4 000 m)

Alfa 135-RC34: 1,500 h.p./2,400 r.p.m./take-off; 1,400 h.p./2,400 r.p.m./11,200 ft. (3 400 m) military rating. Geared drive. 1-speed supercharger. 87-octane gasoline.

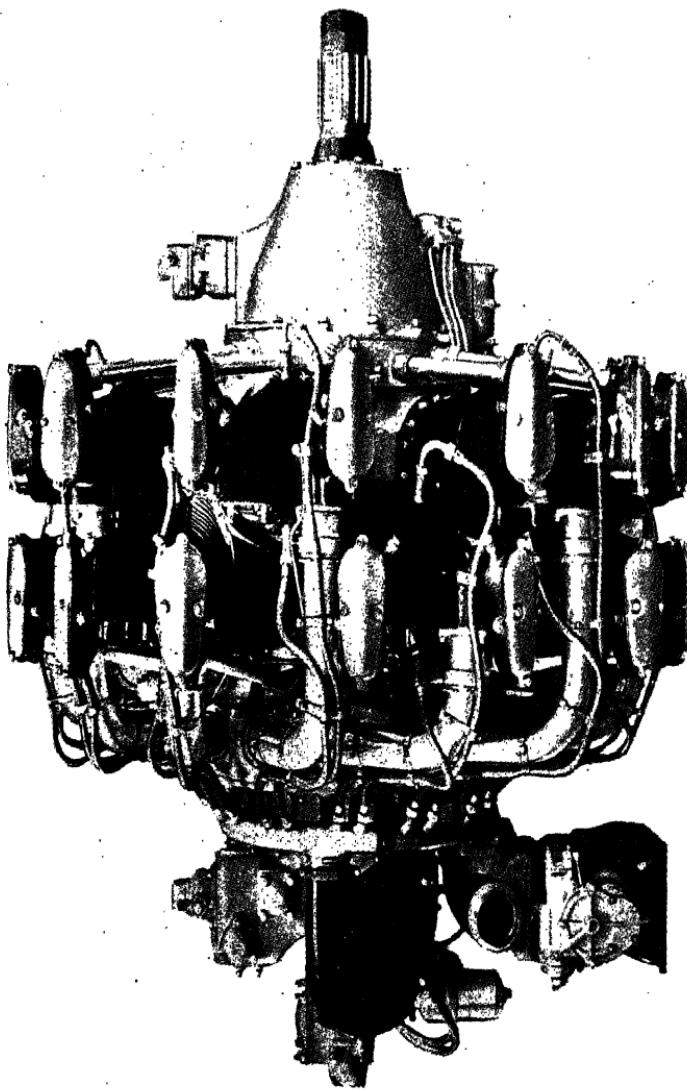
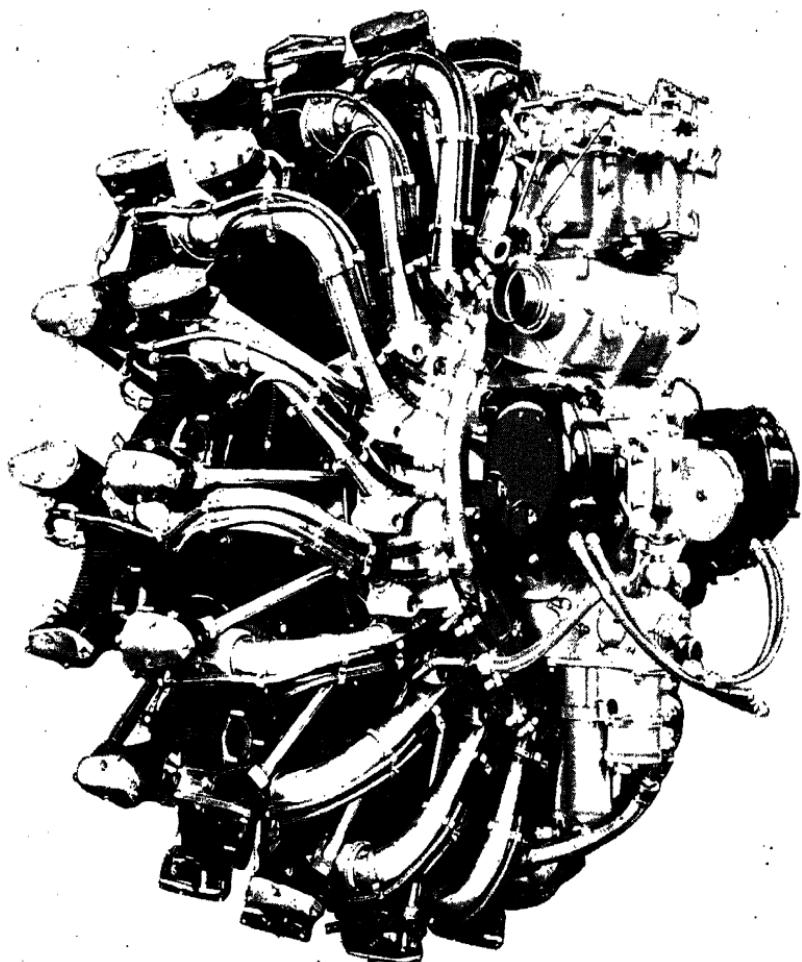


Fig. 74

Fiat A74

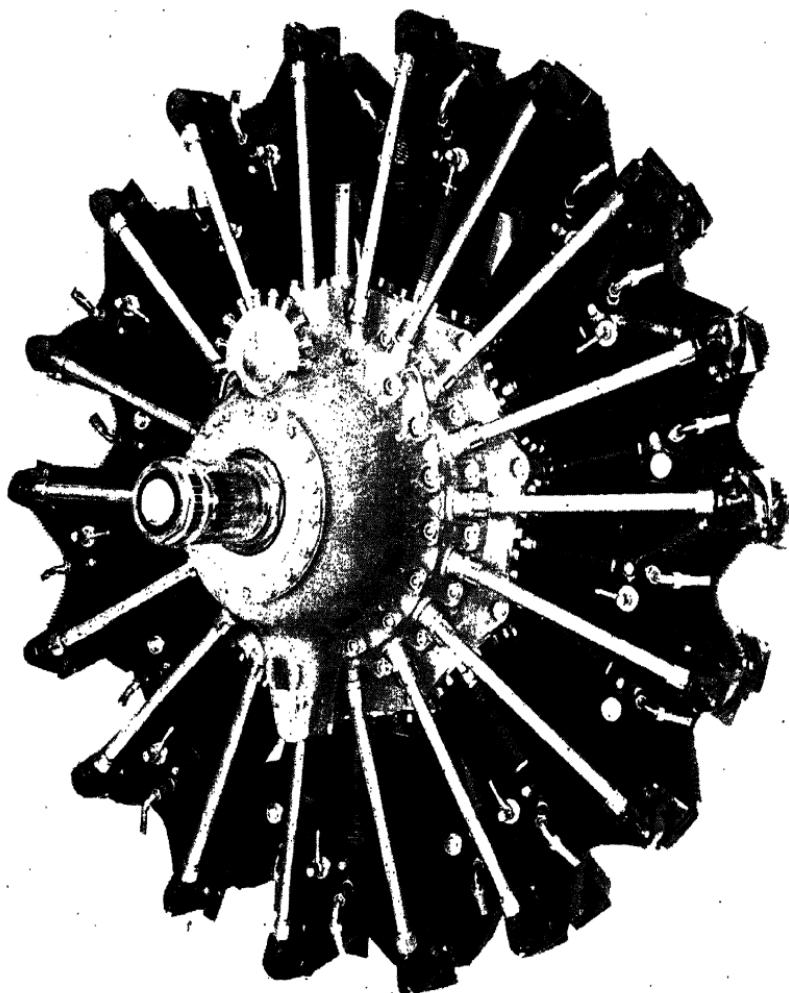
Model	A74-RC38.	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.67:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 8.7:1.	
Carburation	1 Zenith-Stromberg NA-R125RGF updraft carburetor with automatic mixture control and boost control.	
Ignition	2 Marelli MF14 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 100 lb./sq.in. (7,0 kg/cm ²). Dry sump.	
Starter	Garelli compressed air starting system.	
Bore	5.50 in.	140 mm
Stroke	5.71 in.	145 mm
Displacement	1,904 cu.in.	31,2 lit
Compression ratio	6.7:1	6,7:1
Diameter	46.8 in.	1 195 mm
Length	59.4 in.	1 510 mm
Frontal area	11.9 sq.ft.	1,11 m ²
Weight	1,257 lb.	570 kg
Weight/horsepower	1.41 lb./h.p.	0,64 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.47 h.p./cu.in.	28,5 hp/lit
Output/piston area	2.67 h.p./sq.in.	0,41 hp/cm ²
Piston speed (max.)	2,427 ft./min.	12,3 m/sec
B.m.e.p. (max.)	145 lb./sq.in.	10,2 kg/cm ²
Rating (take-off)	890 h.p./2,550 r.p.m.	
Rating (normal)	840 h.p./2,400 r.p.m./12,500 ft. (3 800 m)	
Rating (cruising)	620 h.p./2,000 r.p.m./13,100 ft. (4 000 m)	
A74-RC18:	920 h.p./2,520 r.p.m./take-off; 900 h.p./2,400 r.p.m./5,900 ft. (1 800 m) normal rating. Geared drive. 1-speed supercharger. 87-octane gasoline.	
A74-RC42:	820 h.p./2,520 r.p.m./take-off; 770 h.p./2,300 r.p.m./13,800 ft. (4 200 m) normal rating. Geared drive. 1-speed supercharger. 87-octane gasoline.	
A74-RC138:	Same as A74-RC38. Propeller rotates in opposite direction.	
A76-RC40:	1,100 h.p./2,600 r.p.m./take-off; 1,000 h.p./2,500 r.p.m./13,100 ft. (4 000 m) normal rating. Geared drive. 1-speed supercharger. 87-octane gasoline. Note: This engine has a slightly larger displacement than the A74 series engines.	



Fiat A80

Fiat A80

Model	A80-RC41.
Type	18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.
Construction	3-piece duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 2-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.
Supercharger	Gear-driven 1-speed supercharger, ratio 9.37:1.
Carburation	1 Zenith-Stromberg downdraft carburetor with automatic mixture control and boost control.
Ignition	2 Marelli magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 100 lb./sq.in. (7,0 kg/cm ²). Dry sump.
Starter	Carelli compressed air starting system.
Bore	5.50 in. 140 mm
Stroke	6.50 in. 165 mm
Displacement	2,789 cu.in. 45,7 lit
Compression ratio	6.7:1 6,7:1
Diameter .....	.52.7 in. 1 340 mm
Length .....	.59.3 in. 1 508 mm
Frontal area	15.1 sq.ft. 1,40 m ²
Weight	1,598 lb. 725 kg
Weight/horsepower	1.55 lb./h.p. 0,70 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr. 220 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr. 10 g/hp/hr
Gasoline grade	87 octane 87 octane
Oil grade (viscosity)	100-120 S.U. secs. 20,5 - 25,1 cs
Output/displacement	0.37 h.p./cu.in. 22,8 hp/lit
Output/piston area	2.40 h.p./sq.in. 0,37 hp/cm ²
Piston speed (max.)	2,383 ft./min. 12,1 m/sec
B.m.e.p. (max.)	133 lb./sq.in. 9,3 kg/cm ²
Rating (take-off)	1,030 h.p./2,200 r.p.m.
Rating (normal)	1,000 h.p./2,100 r.p.m./13,500 ft. (4 100 m)
Rating (cruising)	700 h.p./1,800 r.p.m./14,800 ft. (4 500 m)
A80-RC20:	1,200 h.p./2,200 r.p.m./take-off; 1,100 h.p./2,100 r.p.m./6,600 ft. (2 000 m) normal rating. Geared drive. 1-speed supercharger, ratio 7.14:1. 87-octane gasoline.



Fiat A82

Fiat A82

Model A82-RC42.

Type 18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.

Supercharger Gear-driven 1-speed supercharger, ratio 8.65:1.

Carburation 1 Zenith-Stromberg downdraft carburetor with automatic mixture control and boost control.

Ignition 2 Marelli magnetos, 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 100 lb./sq.in. (7,0 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

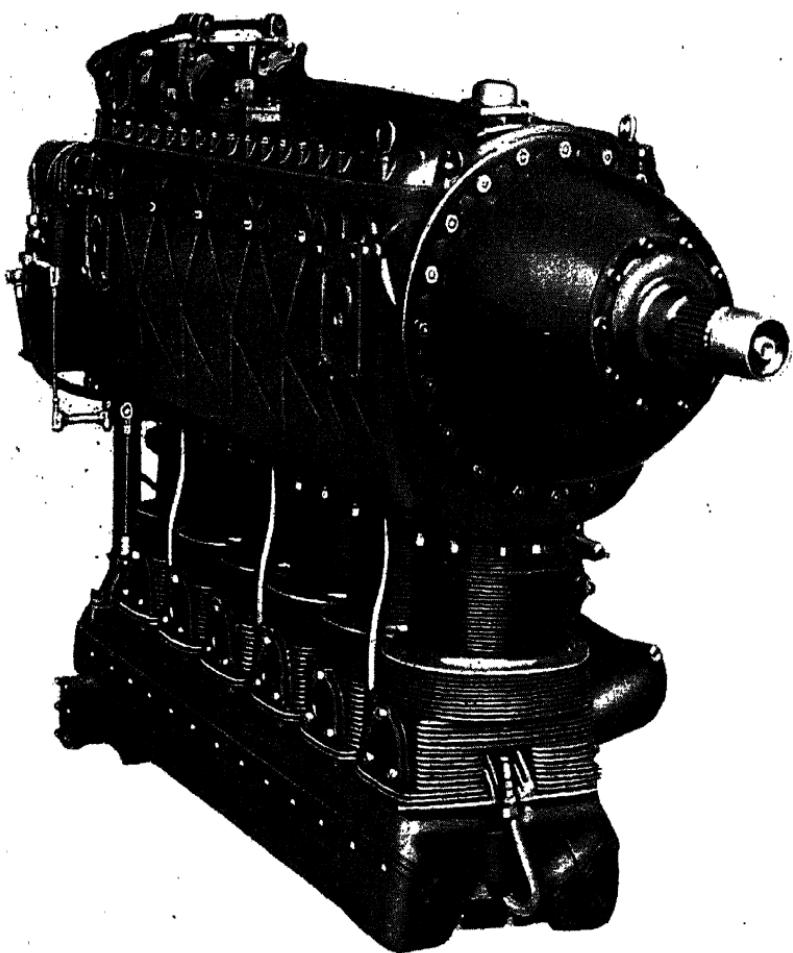
Bore	5.50 in.	140 mm
Stroke	6.69 in.	170 mm
Displacement	2,873 cu.in.	47,1 lit
Compression ratio	6.75:1	6,75:1
Diameter	53.1 in.	1 350 mm
Length	59.1 in.	1 500 mm
Frontal area	15.4 sq.ft.	1,43 m ²
Weight	1,910 lb.	870 kg
Weight/horsepower	1.36 lb./h.p.	0.62 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.48 h.p./cu.in.	29,7 hp/lit
Output/piston area	3.37 h.p./sq.in.	0.52 hp/cm ²
Piston speed (max.)	2,676 ft./min.	13,6 m/sec
B.m.e.p. (max.)	161 lb./sq.in.	11,3 kg/cm ²

Rating (take-off) 1,400 h.p./2,400 r.p.m.

Rating (normal) 1,250 h.p./2,300 r.p.m./13,800 ft. (4 200 m)

Rating (cruising) 950 h.p./1,900 r.p.m./14,800 ft. (4 500 m)

A82-RC40: • 1,500 h.p./2,400 r.p.m./take-off; 1,250 h.p./2,300 r.p.m./13,100 ft. (4 000 m) normal rating. Geared drive. 1-speed supercharger. 87-octane gasoline.



Isotta Fraschini Beta

Isotta Fraschini BetaModel **Beta.**

Type 6 cylinders, inverted in-line, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by overhead camshafts. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Planetary reduction gear, ratio 0.79:1. .

Supercharger Gear-driven 1-speed supercharger, ratio 10.0:1. Automatic pressure regulator.

Carburation 1 Isotta Fraschini updraft carburetor with altitude control.

Ignition 2 Marelli magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

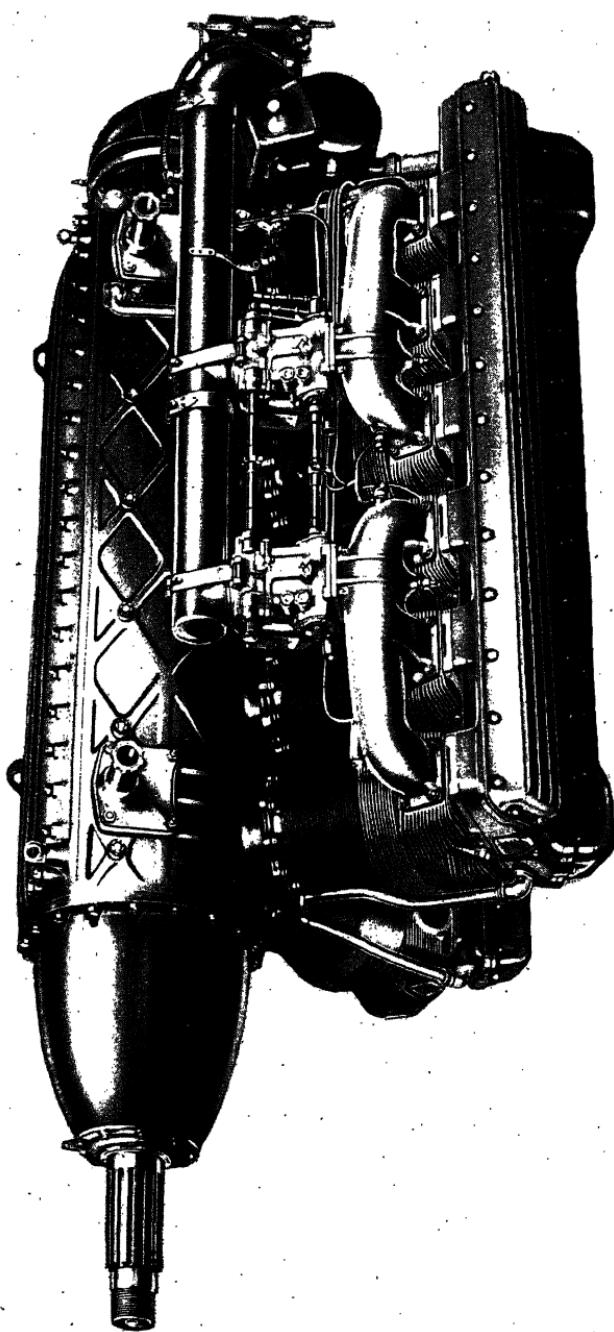
Bore	4.92 in.	125 mm
Stroke	5.12 in.	130 mm
Displacement	586 cu.in.	9,6 lit
Compression ratio	6.5:1	6.5:1
Width	16.1 in.	410 mm
Height	31.5 in.	800 mm
Length	64.0 in.	1 625 mm
Frontal area	3.2 sq.ft.	0,30 m ²
Weight	496 lb.	225 kg
Weight/horsepower	1.65 lb./h.p.	0,75 kg/hp
Fuel consumption (cr.)	0.53 lb./h.p./hr.	240 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.51 h.p./cu.in.	31,3 hp/lit
Output/piston area	2.63 h.p./sq.in.	0,41 hp/cm ²
Piston speed (max.)	2,304 ft./min.	11,7 m/sec
B.m.e.p. (max.)	150 lb./sq.in.	10,5 kg/cm ²

Rating (take-off) 300 h.p./2,700 r.p.m.

Rating (normal) 270 h.p./2,500 r.p.m./4,600 ft. (1 400 m)

Rating (cruising) 210 h.p./2,200 r.p.m./4,600 ft. (1 400 m)

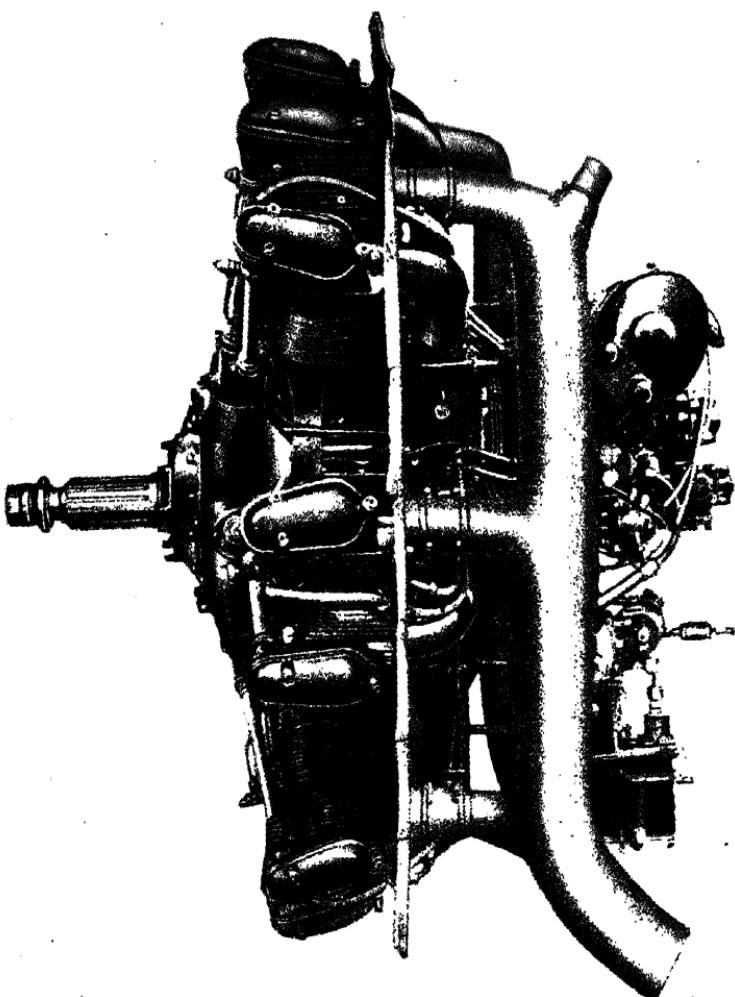
Gamma RC35-IDS: 12-cylinder inverted vee version of the Beta from which the latter was developed. 550 h.p./2,600 r.p.m./take-off; 580 h.p./2,730 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.61:1. 1-speed supercharger, ratio 10.34:1. 87-octane gasoline.



Frasch De

Isotta Fraschini Delta

Model	Delta RC35-IDS.	
Type	12 cylinders, inverted vee 60 degrees, air cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshafts. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Planetary reduction gear, ratio 0.64:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 10.0:1. Automatic boost control.	
Carburation	4 Isotta Fraschini downdraft carburetors with automatic mixture control.	
Ignition	2 Marelli magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Garelli compressed air starting system.	
Bore	5.20 in.	132 mm
Stroke	6.30 in.	160 mm
Displacement	1,630 cu.in.	26,7 lit
Compression ratio	6.4:1	6.4:1
Width	33.1 in.	840 mm
Height	34.8 in.	833 mm
Length	78.7 in.	2 000 mm
Frontal area	7.3 sq.ft.	0,59 m ²
Weight	1,124 lb.	510 kg
Weight/horsepower	1.45 lb./h.p.	0,66 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.47 h.p./cu.in.	28,8 hp/lit
Output/piston area	3.02 h.p./sq.in.	0,47 hp/cm ²
Piston speed (max.)	2,817 ft./min.	14,3 m/sec
B.m.e.p. (max.)	146 lb./sq.in.	10,3 kg/cm ²
Rating (take-off) . . . . .	.770 h.p./2,600 r.p.m./34.6 in. (880 mm) Hg. boost	
Rating (military) . . . . .	.750 h.p./2,600 r.p.m./13,100 ft. (4 000 m)	
Rating (cruising) . . . . .	.520 h.p./2,100 r.p.m./13,100 ft. (4 000 m)	
Delta RC35-1:	610 h.p./2,230 r.p.m./take-off; 700 h.p./2,500 r.p.m./13,100 ft. (4 000 m) military rating. Geared drive. 1-speed supercharger. 87-octane gasoline.	
Delta RC35-ICD:	610 h.p./2,240 r.p.m./take-off; 650 h.p./2,350 r.p.m./11,500 ft. (3 500 m) military rating. Reduction gear ratio 0.64:1. 1-speed supercharger, ratio 9.8:1. 87-octane gasoline. Raised hollow propeller shaft for cannon.	
Delta RC35-IS:	730 h.p./2,400 r.p.m./take-off; 700 h.p./2,480 r.p.m./11,500 ft. (3 500 m) military rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 9.8:1. 87-octane gasoline. Raised hollow propeller shaft for cannon.	



Piaggio P.VII

Piaggio P.VIIModel **P.VII-C35.**

Type 7 cylinders, 1-row radial, air cooled, direct drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads, 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods, 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger Gear-driven 1-speed supercharger, ratio 10.0:1.

Carburation 1 Piaggio T2-80 updraft carburetor with automatic boost control.

Ignition 2 Marelli MF7 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5.0 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	1,177 cu.in.	19.3 lit
Compression ratio	6.5:1	6.5:1
Diameter	49.6 in.	1 256 mm
Length	44.5 in.	1 135 mm
Frontal area	13.4 sq.ft.	1.24 m ²
Weight	783 lb.	355 kg
Weight/horsepower	1.57 lb./h.p.	0.71 kg/hp
Fuel consumption (cr.)	0.47 lb./h.p./hr.	215 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20.5 - 25.1 cs
Output/displacement	0.42 h.p./cu.in.	25.9 hp/lit
Output/piston area	2.75 h.p./sq.in.	0.43 hp/cm ²
Piston speed (max.)	2,275 ft./min.	11.5 m/sec
B.m.e.p. (max.)	158 lb./sq.in.	11.1 kg/cm ²

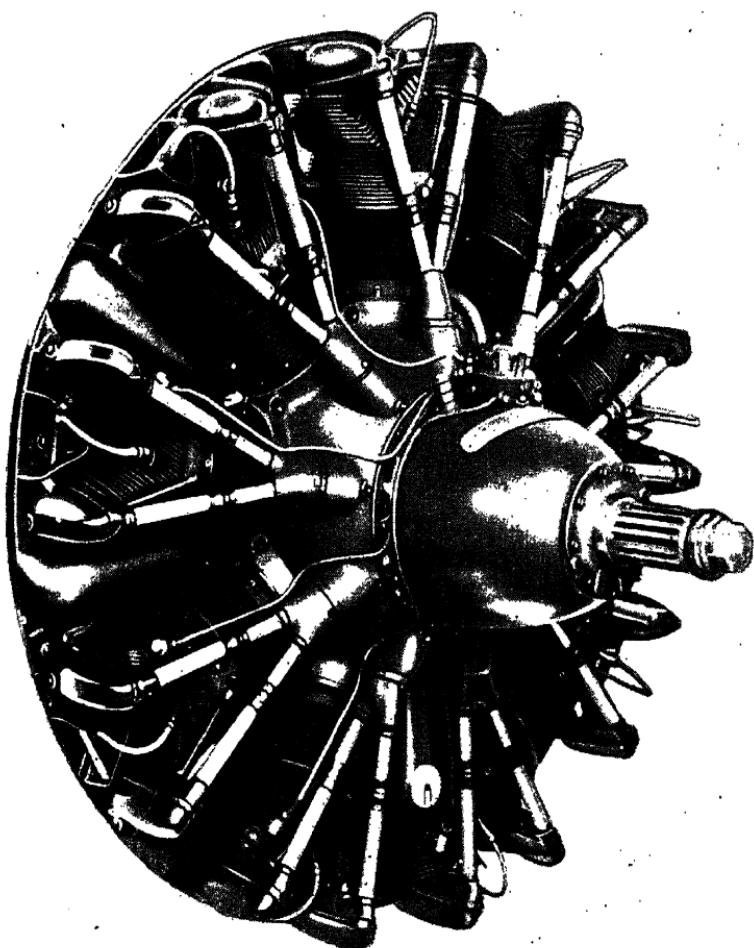
Rating (take-off) 500 h.p./2,100 r.p.m.

Rating (military) 460 h.p./2,100 r.p.m./11,500 ft. (3 500 m)

Rating (cruising) 325 h.p./1,700 r.p.m./11,500 ft. (3 500 m)

P.VII-C16: 430 h.p./2,100 r.p.m./take-off; 460 h.p./2,100 r.p.m./5,200 ft. (1 600 m) military rating. Direct drive. 1-speed supercharger. 87-octane gasoline.

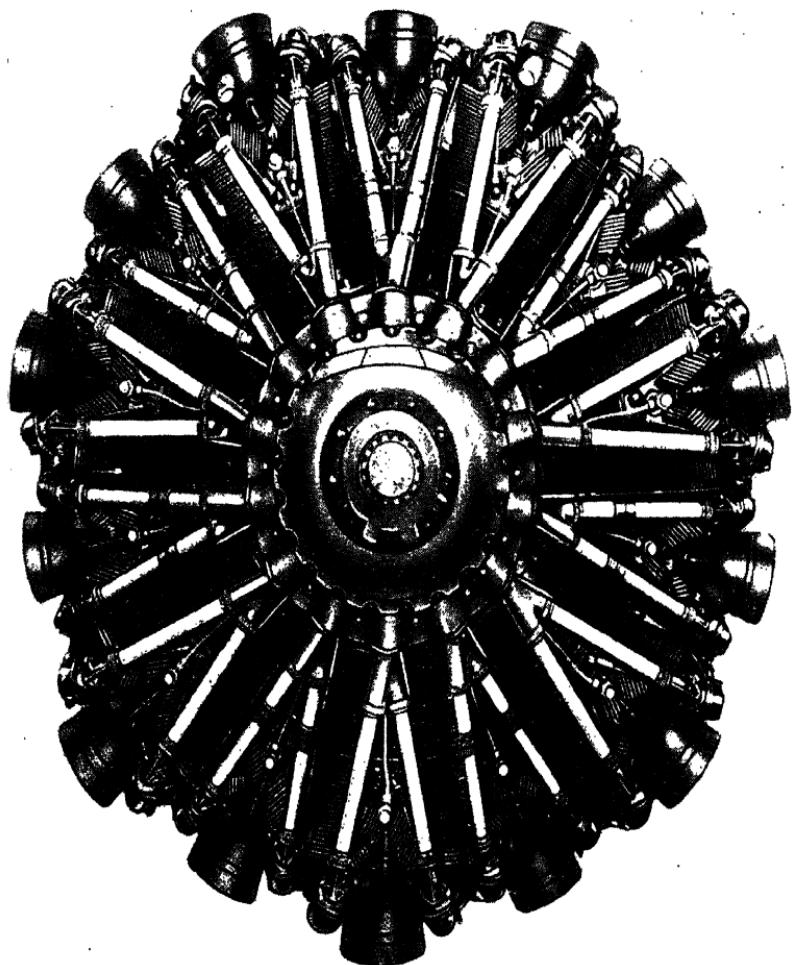
P.VII-C45: 440 h.p./2,100 r.p.m./take-off; 465 h.p./2,100 r.p.m./4,900 ft. (1 500 m) and 390 h.p./2,100 r.p.m./14,800 ft. (4 500 m) military rating. Geared drive. 2-speed supercharger. 87-octane gasoline.



Piaggio P.X

Piaggio P.X

Model	P.X-RC35.	
Type	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 7.35:1.	
Carburation	1 Piaggio T2-80 updraft carburetor with automatic boost control.	
Ignition	2 Marelli MF9 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Gareli compressed air starting system.	
Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	1,519 cu.in.	24,9 lit
Compression ratio	6.0:1	6,0:1
Diameter	50.4 in.	1 280 mm
Length	57.4 in.	1 408 mm
Frontal area	13.8 sq.ft.	1,29 m ²
Weight	948 lb.	430 kg
Weight/horsepower	1.46 lb./h.p.	0,66 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.43 h.p./cu.in.	26,1 hp/lit
Output/piston area	2.77 h.p./sq.in.	0,43 hp/cm ²
Piston speed (max.)	2,437 ft./min.	12,4 m/sec
B.m.e.p. (max.)	151 lb./sq.in.	10,6 kg/cm ²
Rating (take-off)	650 h.p./2,250 r.p.m.	
Rating (military)	625 h.p./2,250 r.p.m./11,500 ft. (3 500 m)	
Rating (cruising)	450 h.p./1,800 r.p.m./11,500 ft. (3 500 m)	
P.IX-RC40:	610 h.p./2,350 r.p.m./take-off; 600 h.p./2,350 r.p.m./3,300 ft. (1 000 m) and 580 h.p./2,350 r.p.m./13,100 ft. (4 000 m) military rating. Geared drive. 2-speed supercharger. 87-octane gasoline.	
P.X-R:	670 h.p./2,350 r.p.m./take-off; 700 h.p./2,300 r.p.m./3,300 ft. (1 000 m) normal rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 7.35:1. 87-octane gasoline.	
P.XVI-RC35D:	700 h.p./2,250 r.p.m./take-off; 670 h.p./2,250 r.p.m./11,500 ft. (3 500 m) military rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 10.0:1. 87-octane gasoline.	
P.XVI-RC35S:	Same as P.XVI-RC35D. Propeller rotates in opposite direction.	



Piaggio P.XI

Piaggio P.XI

Model P.XI-RC40.

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads, 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.

Supercharger Gear-driven 1-speed supercharger, ratio 7.9:1.

Carburation 1 Piaggio T2-100 dual downdraft carburetor with automatic mixture control and boost control.

Ignition 2 Marelli MF14 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

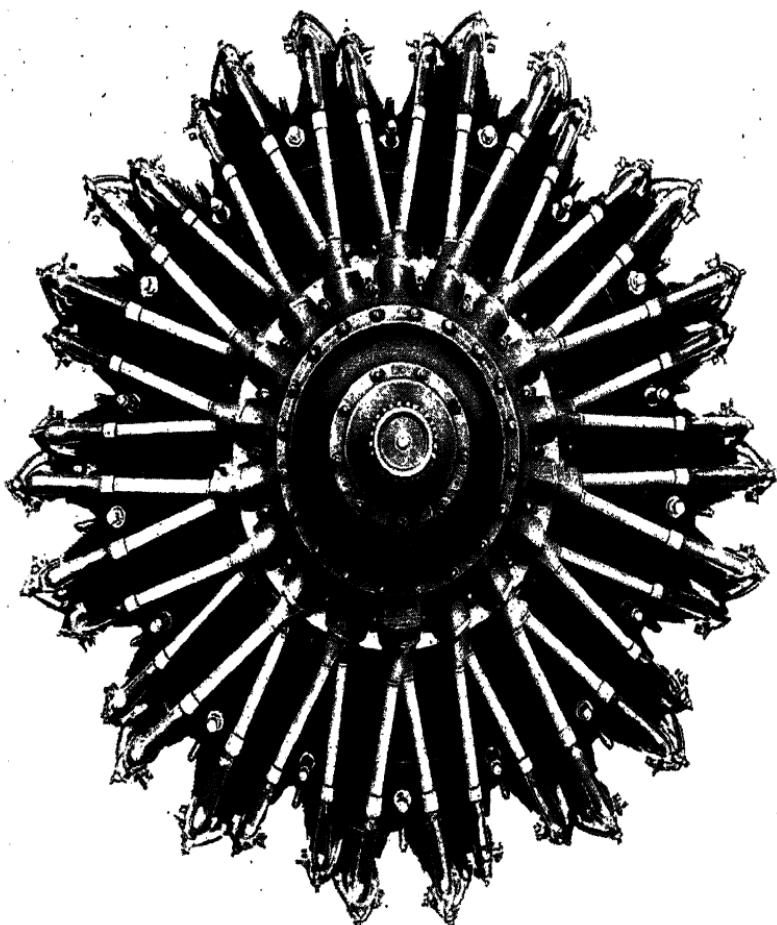
Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	2,356 cu.in.	38.6 lit
Compression ratio	6.0:1	6.0:1
Diameter	52.4 in.	1 328 mm
Length	66.9 in.	1 700 mm
Frontal area	15.0 sq.ft.	1,39 m ²
Weight	1,433 lb.	650 kg
Weight/horsepower	1.43 lb./h.p.	0.65 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20.5 - 25.1 cs
Output/displacement	0.42 h.p./cu.in.	25.9 hp/lit
Output/piston area	2.75 h.p./sq.in.	0.43 hp/cm ²
Piston speed (max.)	2,383 ft./min.	12.1 m/sec
B.m.e.p. (max.)	153 lb./sq.in.	10.8 kg/cm ²

Rating (take-off) 1,000 h.p./2,200 r.p.m.

Rating (military) 1,000 h.p./2,200 r.p.m./13,100 ft. (4 000 m)

Rating (cruising) 700 h.p./1,800 r.p.m./13,100 ft. (4 000 m)

P.XI-RC15: 1,200 h.p./2,300 r.p.m./take-off; 1,200 h.p./2,300 r.p.m./4,900 ft. (1 500 m) military rating. Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 7.9:1. 87-octane gasoline.



Piaggio P.XII

Piaggio P.XIIModel **P.XII-RC35.**

Type 18 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 1-piece barrel type duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads, 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.

Supercharger Gear-driven 1-speed supercharger, ratio 7.84:1.

Carburation 1 Piaggio downdraft carburetor with automatic mixture control and boost control.

Ignition 2 Marelli AQ18 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Garelli compressed air starting system.

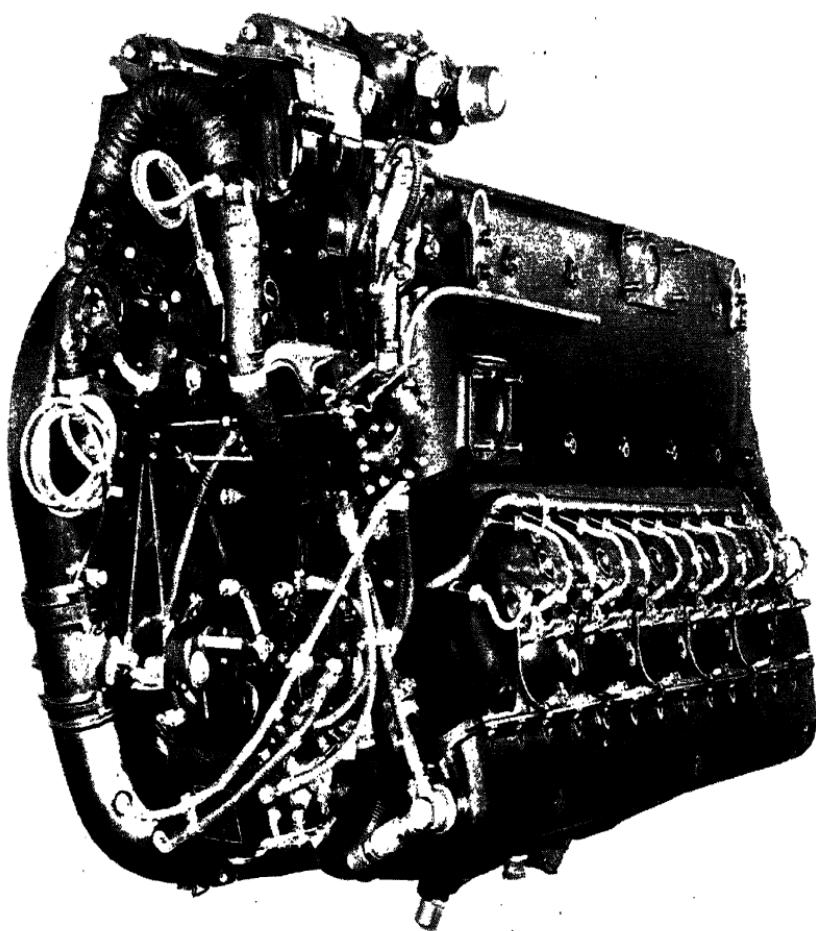
Bore	5.75 in.	146 mm
Stroke	6.93 in.	176 mm
Displacement	3,234 cu.in.	53,0 lit
Compression ratio	6.5:1	6,5:1
Diameter	55.5 in.	1 410 mm
Length	66.9 in.	1 700 mm
Frontal area	16.8 sq.ft.	1,56 m ²
Weight	1,874 lb.	850 kg
Weight/horsepower	1.25 lb./h.p.	0,57 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	208 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	87 octane	87 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.49 h.p./cu.in.	28,3 hp/lit
Output/piston area	3.21 h.p./sq.in.	0,50 hp/cm ²
Piston speed (max.)	2,425 ft./min.	12,3 m/sec
B.m.e.p. (max.)	175 lb./sq.in.	12,3 kg/cm ²

Rating (take-off) 1,500 h.p./2,100 r.p.m.

Rating (military) 1,350 h.p./2,100 r.p.m./11,500 ft. (3 500 m)

Rating (cruising) 1,000 h.p./1,700 r.p.m./11,500 ft. (3 500 m)

P.XII-RC40: 1,600 h.p./2,200 r.p.m./take-off. Geared drive. 1-speed supercharger. 87-octane gasoline.**P.XXII-RC35D:** 1,700 h.p./2,200 r.p.m./take-off; 1,600 h.p./2,200 r.p.m./11,500 ft. (3 500 m) military rating. Reduction gear ratio 0.57: 1. 1-speed supercharger. 87-octane gasoline. Note: This engine has a slightly larger displacement than the P.XII series engines.**P.XXII-RC35R:** Same as P.XXII-RC35D. Propeller rotates in opposite direction.

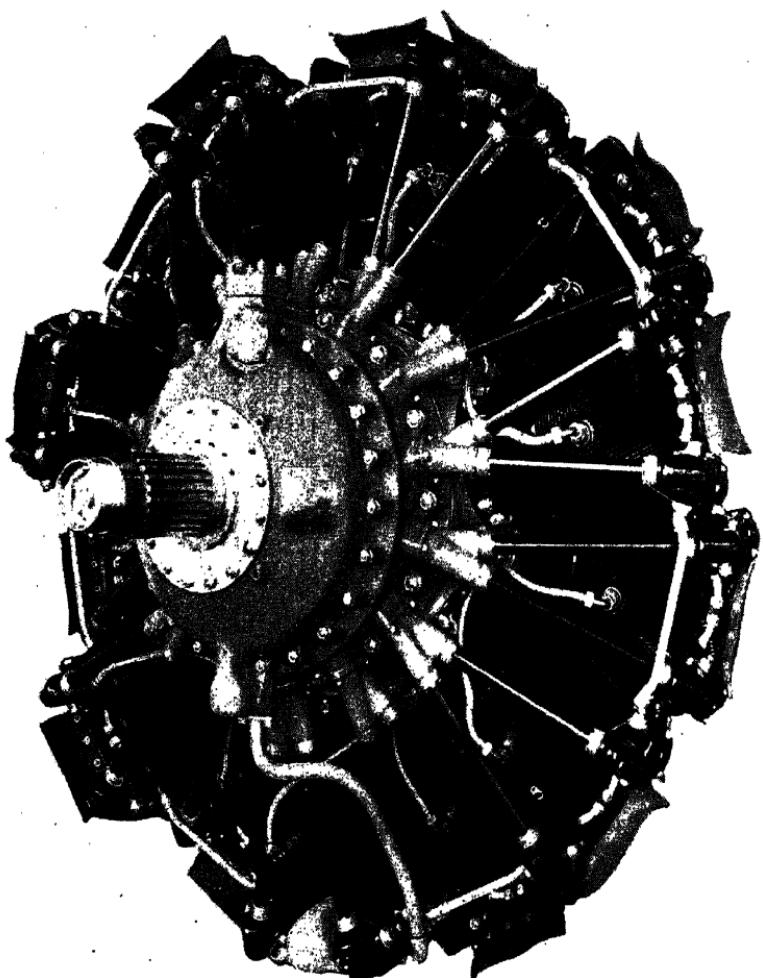


Aichi Atsuta

Aichi Atsuta

Model	Atsuta 21.	
Type .....	.12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece aluminum alloy crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank-shaft supported in 7 plain bearings. Spur reduction gear, ratio 0.53:1. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control.	
Injection	Direct fuel injection. 1 Bosch type 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch type injector per cylinder.	
Ignition	2 Kokusan magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.	
Starter	Kokusan electric inertia starter.	
Bore	5.90 in.	150 mm
Stroke	6.30 in.	160 mm
Displacement	2,069 cu.in.	33,9 lit
Compression ratio	7.9:1	7,9:1
Width	28.0 in.	712 mm
Height	39.4 in.	1 000 mm
Length	67.7 in.	1 720 mm
Frontal area	5.4 sq.ft.	0,50 m ²
Weight	1,400 lb.	635 kg
Weight/horsepower	1.10 lb./h.p.	0,50 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.011 lb./h.p./hr.	5 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5-25,1 cs
Output/displacement	0.61 h.p./cu.in.	37,5 hp/lit
Output/piston area	3.87 h.p./sq.in.	0,60 hp/cm ²
Piston speed (max.)	2,730 ft./min.	13,8 m/sec
B.m.e.p. (max.)	185 lb./sq.in.	13,0 kg/cm ²
Rating (take-off)	1,200 h.p./2,600 r.p.m./45.8 in. (1 163 mm) Hg. boost	
Rating (military)	1,100 h.p./2,600 r.p.m./13,500 ft. (4 100 m)	
Rating (max. cruising)	950 h.p./2,200 r.p.m./15,000 ft. (4 100 m)	

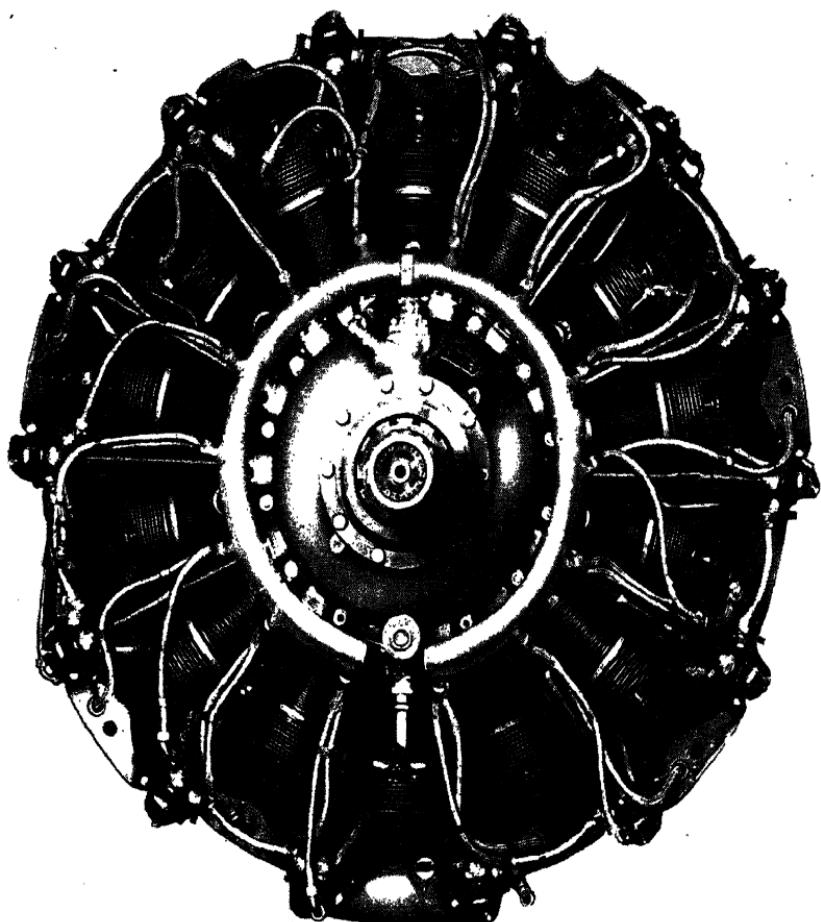
Note: This engine is similar to the Japanese Kawasaki Type 2. These Japanese engines were derived from the German Daimler-Benz DB 601-A engine.



Mitsubishi Kinsei

Mitsubishi Kinsei

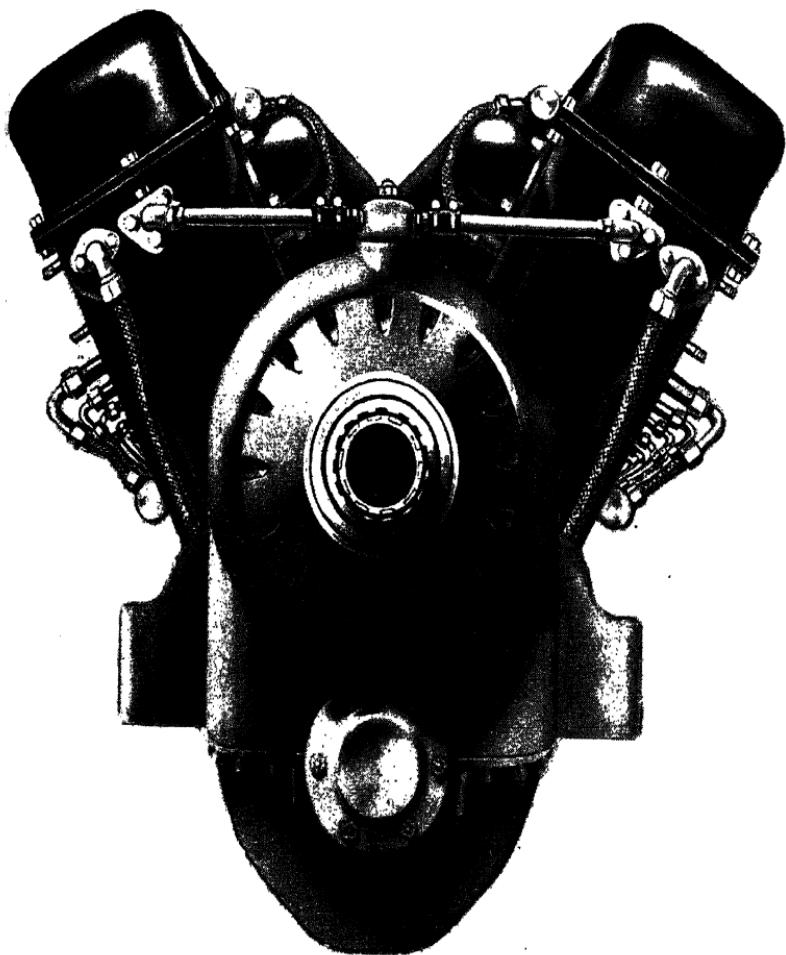
Model	Kinsei 44.	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings and 1 central ball bearing. Planetary reduction gear, ratio 0.70:1.	
Supercharger	Gear-driven 1-speed supercharger, ratio 8.48:1.	
Carburation	1 Nakajima 75 downdraft carburetor with automatic mixture control and boost control.	
Ignition	2 Kokusan 14BF-2L magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-100 lb./sq.in. (5,0 - 7,0 kg/cm ²). Dry sump.	
Starter	Kokusian electric inertia starter.	
Bore	5.50 in.	140 mm
Stroke	5.90 in.	150 mm
Displacement	1,971 cu.in.	32,3 lit
Compression ratio	6.6:1	6,6:1
Diameter	48.0 in.	1 218 mm
Length	65.0 in.	1 646 mm
Frontal area	12.6 sq.ft.	1,17 m ²
Weight	1,200 lb.	545 kg
Weight/horsepower	1.12 lb./h.p.	0,51 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.54 h.p./cu.in.	33,2 hp/lit
Output/piston area	3.22 h.p./sq.in.	0,50 hp/cm ²
Piston speed (max.)	2,462 ft./min.	12,5 m/sec
B.m.e.p. (max.)	172 lb./sq.in.	12,1 kg/cm ²
Rating (take-off)	1,000 h.p./2,500 r.p.m./37.7 in. (909 mm) Hg. boost	
Rating (military)	1,075 h.p./2,500 r.p.m./13,100 ft. (4 000 m)	
Rating (cruising)	825 h.p./2,000 r.p.m./13,100 ft. (4 000 m)	
Kinsei 43:	1,050 h.p./2,500 r.p.m./take-off; 1,060 h.p./2,500 r.p.m./6,600 ft. (2 000 m) military rating. Reduction gear ratio 0.70:1. 1-speed supercharger. 87-octane gasoline.	
Kinsei 45, 46:	1,000 h.p./2,600 r.p.m./take-off; 1,050 h.p./2,600 r.p.m./14,100 ft. (4 300 m) military rating. Geared drive. 1-speed supercharger. 92-octane gasoline.	



Nakajima Sakae

Nakajima Sakae

Model	Sakae 21.	
Type	14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings and 1 central ball bearing. Planetary reduction gear, ratio 0.69:1.	
Supercharger	Gear-driven 2-speed supercharger.	
Carburation	1 Nakajima 2-barrel downdraft carburetor with automatic mixture control and boost control.	
Ignition	2 Kokusan 14BF-2L magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-100 lb./sq.in. (5,0 - 7,0 kg/cm ²). Dry sump.	
Starter	Kokusan electric inertia starter.	
Bore	5.12 in.	130 mm
Stroke	5.90 in.	150 mm
Displacement	1,700 cu.in.	27,8 lit
Compression ratio	6.5:1	6,5:1
Diameter	44.1 in.	1 120 mm
Length	66.2 in.	1 680 mm
Frontal area	10.6 sq.ft.	0,98 m ²
Weight	1,190 lb.	540 kg
Weight/horsepower	1.04 lb./h.p.	0,47 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	92 octane	92 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.68 h.p./cu.in.	41,3 hp/lit
Output/piston area	4.00 h.p./sq.in.	0,62 hp/cm ²
Piston speed (max.)	2,655 ft./min.	13,5 m/sec
B.m.e.p. (max.)	199 lb./sq.in.	14,0 kg/cm ²
Rating (take-off)	1,150 h.p./2,700 r.p.m.	
Rating (military)	950 h.p./2,700 r.p.m./19,700 ft. (6 000 m)	
Rating (cruising)	700 h.p./2,200 r.p.m./19,700 ft. (6 000 m)	
Sakae 11:	980 h.p./2,600 r.p.m./take-off; 950 h.p./2,600 r.p.m./10,000 ft. (3 000 m) military rating. Reduction gear ratio 0.69:1. 1-speed supercharger, ratio 7.5:1. 87-octane gasoline.	
Sakae 12:	1,000 h.p./2,600 r.p.m./take-off; 900 h.p./2,600 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.69:1. 1-speed supercharger, ratio 7.5:1. 92-octane gasoline.	
Sakae 22:	Same as Sakae 21.	



AM-38

AM-38Model **AM-38A.**

Type 12 cylinders, vee 60 degrees, water cooled, geared drive, supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase, 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear.

Supercharger Gear-driven 2-speed supercharger.

Carburation 4 pressure type carburetors.

Ignition 2 Electrozavod magnetos, 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 85 lb./sq.in. (6,0 kg/cm²). Dry sump.

Starter Electric inertia starter.

Bore	6.30 in.	160 mm
Stroke	7.48 in.	190 mm
Displacement	2,800 cu.in.	45,9 lit
Compression ratio	7.0:1	7.0:1
Width	30.3 in.	770 mm
Height	39.4 in.	1 000 mm
Length	78.7 in.	2 000 mm
Frontal area	5.8 sq.ft.	0,54 m ²
Weight	1,830 lb.	830 kg
Weight/horsepower	1.14 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.022 lb./h.p./hr.	10 g/hp/hr
Gasoline grade	95 octane	95 octane
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.57 h.p./cu.in.	34,9 hp/lit
Output/piston area	4.27 h.p./sq.in.	0,66 hp/cm ²
Piston speed (max.)	2,805 ft./min.	14,2 m/sec
B.m.e.p. (max.)	201 lb./sq.in.	14,1 kg/cm ²

Rating (take-off) 1,600 h.p./2,250 r.p.m.

Rating (military, low) 1,500 h.p./2,250 r.p.m./6,600 ft. (2 000 m)

Rating (military, high) 1,400 h.p./2,250 r.p.m./19,700 ft. (6 000 m)

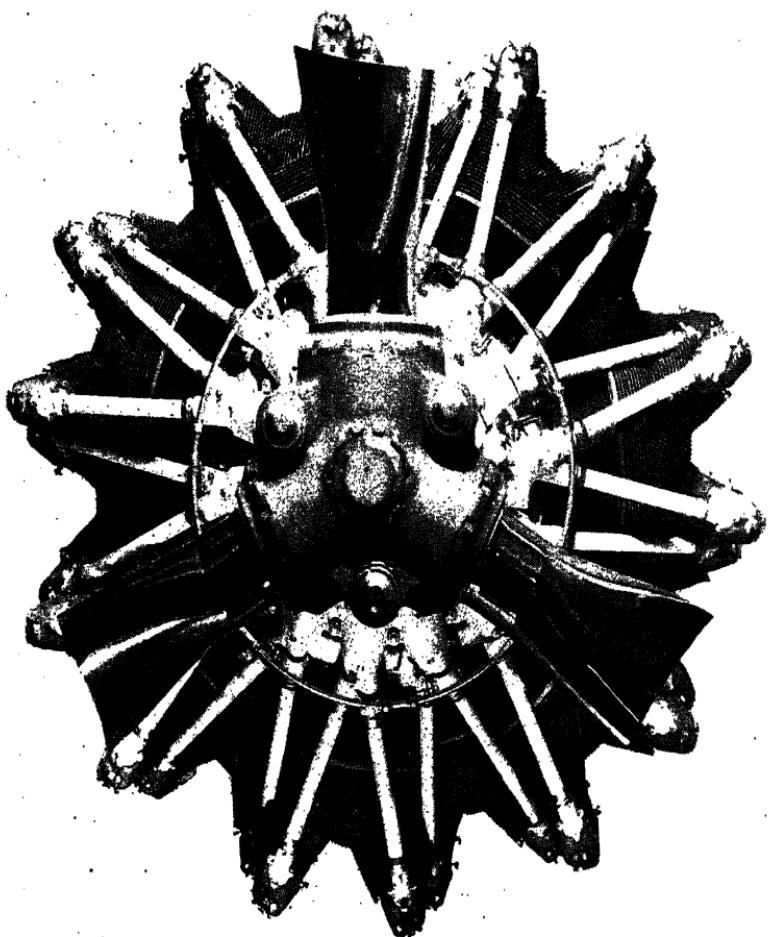
Rating (max. cruising) 1,100 h.p./1,800 r.p.m./9,800 ft. (3,000 m)

AM-35: 1,200 h.p./2,250 r.p.m./take-off; 1,100 h.p./2,250 r.p.m./6,600 ft. (2 000 m) and 1,100 h.p./2,250 r.p.m./13,100 ft. (4 000 m) military rating. Geared drive. 2-speed supercharger. 87-octane gasoline.

AM-35A: 1,350 h.p./2,250 r.p.m./take-off; 1,200 h.p./2,250 r.p.m./6,600 ft. (2 000 m) and 1,000 h.p./2,250 r.p.m./16,400 ft. (5 000 m) military rating. Geared drive. 2-speed supercharger. 95-octane gasoline.

AM-38B: 1,600 h.p./2,250 r.p.m./take-off; 1,500 h.p./2,250 r.p.m./6,600 ft. (2 000 m) military rating. Geared drive. 1-speed supercharger. 95-octane gasoline.

Note: These engines were developed from the 900 h.p. Mikouline AM-34 which was exhibited at the Paris Aero Show in 1936.



M-88

M-88Model **M-88.**

Type 14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle.

Construction 3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods, 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.67:1.

Supercharger Gear-driven 2-speed supercharger.

Carburation 1 updraft carburetor with automatic boost control and altitude control.

Ignition 2 Electrozavod magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.

Starter Electric inertia starter.

Bore	5.75 in.	146 mm
Stroke	6.50 in.	165 mm
Displacement	2,360 cu.in.	38,7 lit
Compression ratio	6.1:1	6.1:1
Diameter	50.8 in.	1 290 mm
Length	59.1 in.	1 500 mm
Frontal area	14.0 sq.ft.	1,30 m ²
Weight	1,500 lb.	680 kg
Weight/horsepower	1.37 lb./h.p.	0,62 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	95 octane	95 octane
Oil grade (viscosity)	120 S.U. secs.	25,1 cs
Output/displacement	0.46 h.p./cu.in.	28.4 hp/lit
Output/piston area	3.03 h.p./sq.in.	0.47 hp/cm ²
Piston speed (max.)	2,600 ft./min.	13,2 m/sec
B.m.e.p. (max.)	152 lb./sq.in.	10,7 kg/cm ²

Rating (take-off) 1,100 h.p./2,400 r.p.m.

Rating (military, low) 1,100 h.p./2,400 r.p.m./7,200 ft. (2 200 m)

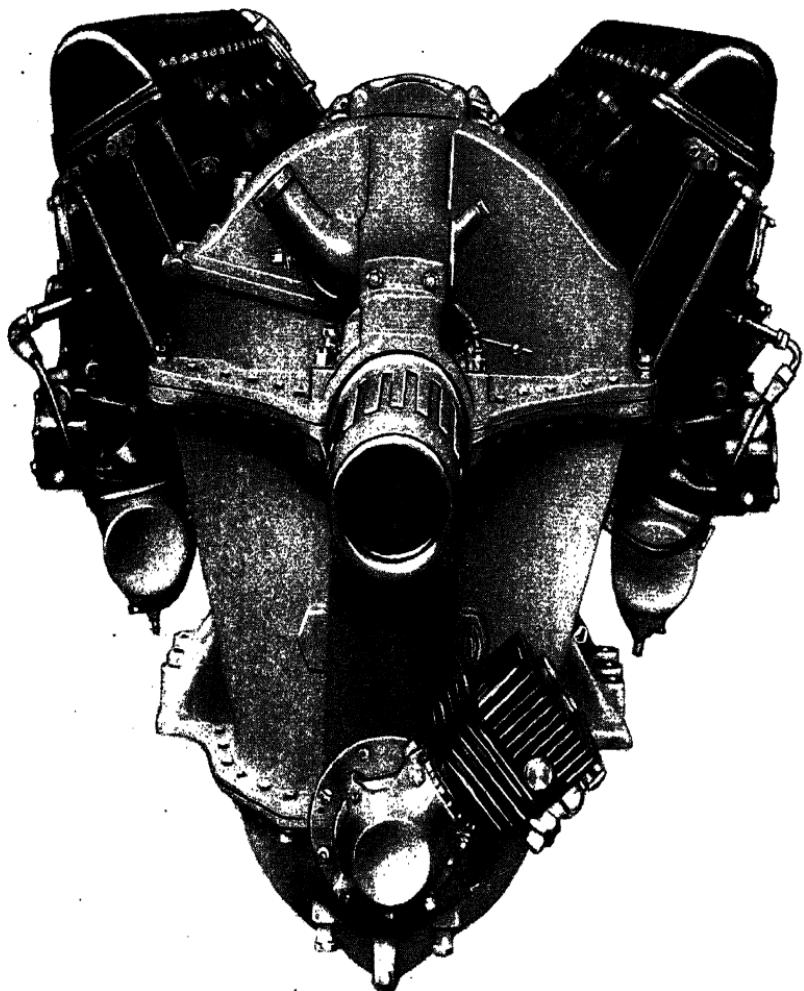
Rating (military, high) 1,000 h.p./2,400 r.p.m./13,100 ft. (4 000 m)

Rating (cruising) 750 h.p./2,100 r.p.m./13,100 ft. (4 000 m)

M-85: 1,000 h.p./2,300 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.5:1. 87-octane gasoline.

M-87B: Similar to M-88.

Note: These engines are similar to the French Gnome-Rhone 14N engine from which they were developed.

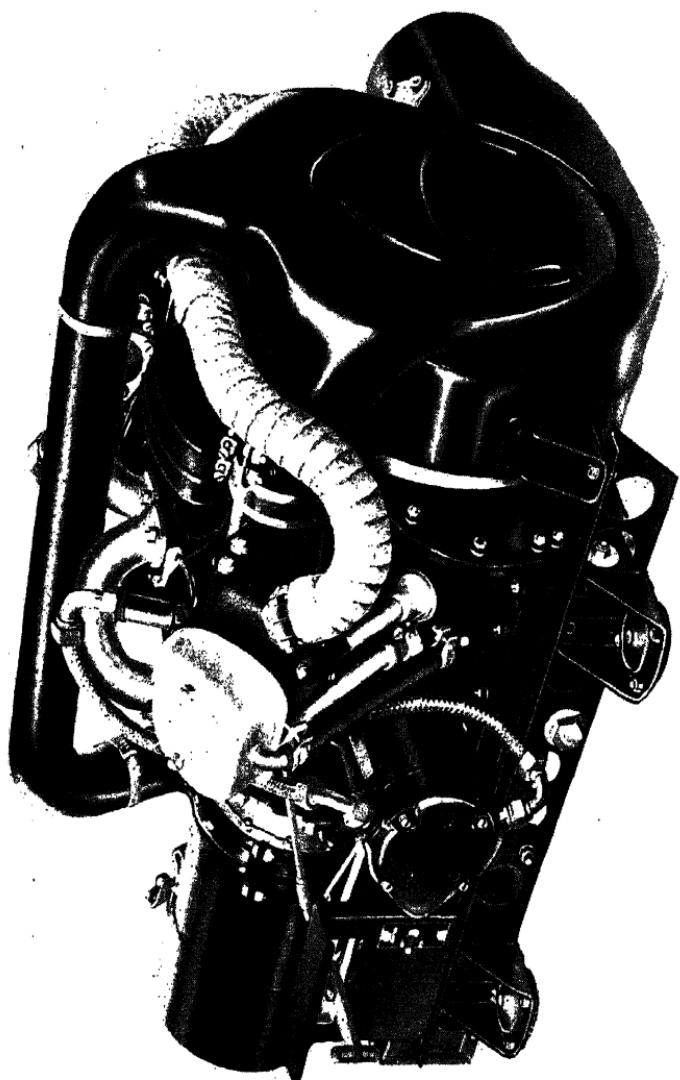


M-105

M-105

Model	M-105P.	
Type	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.59:1. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven 2-speed supercharger, ratios 7.85:1 and 10.0:1.	
Carburation	6 updraft carburetors with automatic pressure regulators for altitude control.	
Ignition	2 Electrozavod magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 85 lb./sq.in. (6,0 kg/cm ²). Dry sump.	
Starter	Electric inertia starter.	
Bore	5.90 in.	150 mm
Stroke	6.69 in.	170 mm
Displacement	2,197 cu.in.	36,0 lit
Compression ratio	7.0:1	7,0:1
Width	30.6 in.	777 mm
Height	37.8 in.	960 mm
Length	79.8 in.	2 027 mm
Frontal area	5.5 sq.ft.	0,51 m ²
Weight	1,268 lb.	575 kg
Weight/horsepower	1.15 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.48 lb./h.p./hr.	220 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Casoline grade	95 octane	95 octane
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.50 h.p./cu.in.	30,5 hp/lit
Output/piston area	3.34 h.p./sq.in.	0,52 hp/cm ²
Piston speed (max.)	2,899 ft./min.	14,7 m/sec
B.m.e.p. (max.)	152 lb./sq.in.	10,7 kg/cm ²
Rating (take-off)	1,100 h.p./2,600 r.p.m./38.6 in. (980 mm) Hg. boost	
Rating (military, low)	1,100 h.p./2,700 r.p.m./6,600 ft. (2 000 m)	
Rating (military, high)	1,050 h.p./2,700 r.p.m./13,100 ft. (4 000 m)	
Rating (normal, low)	950 h.p./2,600 r.p.m./6,600 ft. (2 000 m)	
Rating (normal, high)	945 h.p./2,600 r.p.m./13,100 ft. (4 000 m)	
M-100:	900 h.p./2,400 r.p.m./take-off; 900 h.p./2,400 r.p.m./6,600 ft. (2 000 m) military rating. Geared drive, 1-speed supercharger. 87-octane gasoline. Hollow propeller shaft for cannon.	
M-103:	1,000 h.p./2,400 r.p.m./take-off; 950 h.p./2,400 r.p.m./11,800 ft. (3 600 m) military rating. Geared drive, 1-speed supercharger. 95-octane gasoline. Hollow propeller shaft for cannon.	
M-105R:	Same as M-105P, but does not have hollow propeller shaft for cannon.	
M-107:	1,200 h.p./2,700 r.p.m./take-off; 1,100 h.p./2,700 r.p.m./6,600 ft. (2,000 m) and 1,100 h.p./2,700 r.p.m./16,400 ft. (5 000 m) military rating. Geared drive, 2-speed supercharger. 95-octane gasoline. Hollow propeller shaft for cannon.	

Note: These engines are similar to the French Hispano-Suiza 12Y engine from which they were developed.



Andover Series 32

Andover, Series V-32

Country United States of America.

Model V-32.

Type (engine) 2 cylinders, vee 90 degrees, air cooled, geared drive, not supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Spur step-up gear, ratio 1.95:1.

Supercharger None.

Carburation 1 Andover KB10000 2-choke updraft carburetor with manual altitude control.

Ignition 1 Wico Rem 1574 magneto. 1 18-mm short reach spark plug per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm²). Wet sump.

Starter Hand starter or motorizing generator.

Bore	2.75 in.	70 mm
Stroke	2.686 in.	68 mm
Displacement	32 cu.in.	0,52 lit
Compression ratio	7.8:1	7,8:1
Width	20.5 in.	520 mm
Height	16.5 in.	418 mm
Length	30.0 in.	762 mm
Weight of unit (net)	121 lb.	55 kg
Weight/kw. output (cont.)	24.2 lb./kw.	11 kg/kw
Fuel consumption (cont.)	1.4 lb./kw./hr.	0,63 kg/kw/hr
Oil consumption (cont.)	0.03 lb./kw./hr.	14 g/kw/hr
Gasoline grade	87-100/130 grade	87-100/130 grade
Oil grade (viscosity)	.65 S.U. secs.	11,7 cs
Output/displacement	0.47 h.p./cu.in.	28,8 hp/lit
Output/piston area	1.26 h.p./sq.in.	0,20 hp/cm ²
Piston speed (max.)	1,432 ft./min.	7,2 m/sec
B.m.e.p. (max.)	118 lb./sq.in.	8,3 kg/cm ²

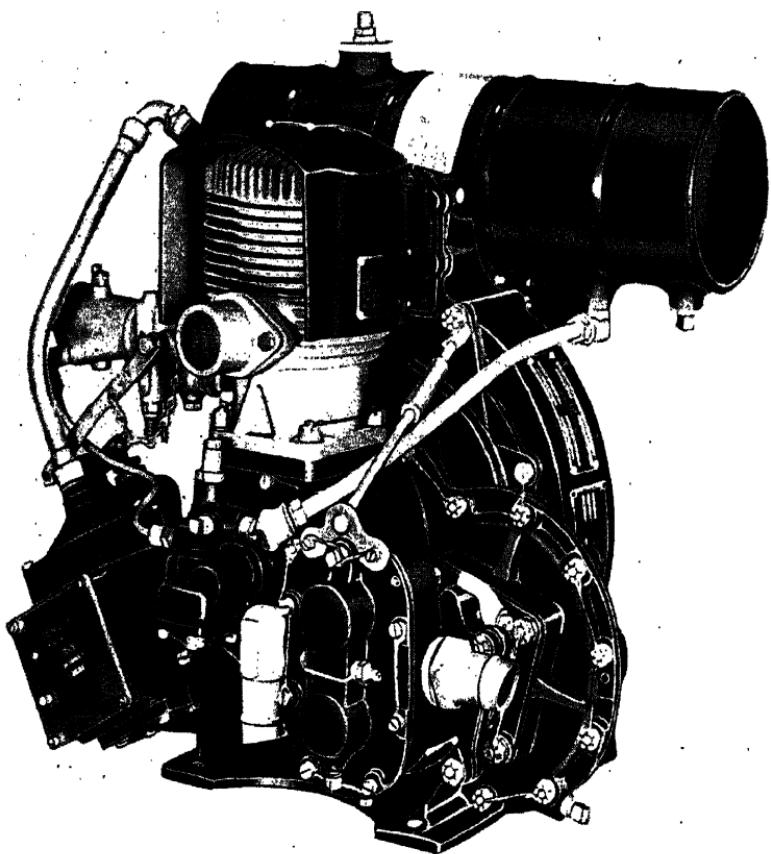
Rating (maximum) 15 h.p./3,200 r.p.m./sea level

Rating (continuous) 10 h.p./3,200 r.p.m./sea level

Output (overload) 7.5 kw. 28.5 v. D.C./sea level

Output (continuous) 5.0 kw. 28.5 v. D.C./sea level

The engine is coupled through a geared step-up drive to a 28.5 volt D.C. AAF P-2 (Eclipse 915) aircraft type electric generator. The unit is mounted horizontally. Cooling is by means of a fan and ducts with baffles around the cylinders. An automatic voltage regulator controls the electric power generated to suit the 24-volt system on the airplane.



Eclipse, Series NEG

Eclipse, Series NEG

Country	United States of America.	
Model	NEG-1 (Model 3017).	
Type (engine)	1 cylinder, vertical, air cooled, direct drive, not supercharged, 2-cycle.	
Construction	1-piece aluminum alloy crankcase with cover plate. Cylinder of cast aluminum with integral head. Steel cylinder liner. Crankcase compression with transfer passage and port in cylinder wall. Piston with deflector on head. 1-throw 1-piece counter-balanced crankshaft supported in 2 ball bearings.	
Supercharger	None.	
Carburation	1 Tillotson straight tube carburetor.	
Ignition	1 Bendix-Scintilla S-1 magneto. 1 18-mm (Aero) short reach spark plug. Shielded ignition system.	
Lubrication	Lubricating oil mixed with the gasoline, ratio 1:10.	
Starter	Pull rope.	
Bore	2.50 in.	63 mm
Stroke	2.50 in.	63 mm
Displacement	12 cu.in.	0,20 lit
Compression ratio	6.0:1	6,0:1
Width	16.1 in.	408 mm
Height	20.5 in.	509 mm
Length	15.9 in.	404 mm
Weight of unit (net)	63 lb.	29 kg
Weight/kw. output (cont.)	21.0 lb./kw.	9,5 kg/kw
Fuel consumption (cont.)	1.7 lb./kw./hr.	0,77 kg/kw/hr
Oil consumption (cont.)	0.13 lb./kw./hr.	59 g/kw/hr
Gasoline grade	87-100/130 grade	87-100/130 grade
Oil grade (viscosity)	40-100 S.U. secs.	4,3 - 20,5 cs
Output/displacement	0.35 h.p./cu.in.	21,2 hp/lit
Output/piston area	0.82 h.p./sq.in.	0,13 hp/cm ²
Piston speed (max.)	1,667 ft./min.	8,4 m/sec
B.m.e.p. (max.)	69 lb./sq.in.	4,8 kg/cm ²
Rating (maximum)	4.25 h.p./4,000 r.p.m./sea level	
Rating (continuous)	4.0 h.p./4,000 r.p.m./sea level	
Output (overload)	None.	
Output (continuous)	3 kw. 28.5 v. D.C., or 3 kw. 120 v. A.C./sea level	

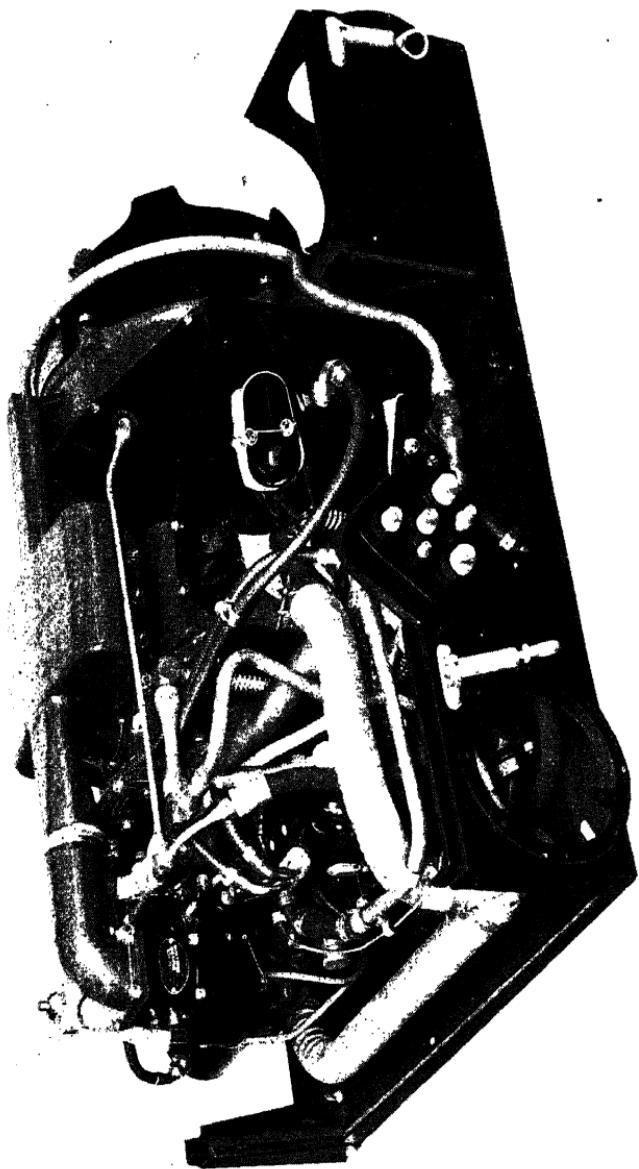
The engine is direct coupled to an Eclipse 638-1 D.C.-A.C. electric generator. The unit is mounted horizontally. Cooling is by means of an integral blower fan. The remote control system is automatic and the engine speed is regulated by a centrifugal governor. Automatic voltage regulators control the electric power generated to suit both 24-volt and 120-volt systems on the airplane. An additional power take-off geared at 0.345 times engine speed is provided.

NEG-1A (Model 3359): Same as NEG-1 (Model 3017). The gasoline is obtained from the main airplane supply tanks and is fed to the engine through an auxiliary float chamber while the lubricating oil is fed to the carburetor air horn from a tank mounted on the engine with an integral metering pump.

NEG-1A (Model 3359-1): Same as NEG-1A (Model 3359).

NEG-1A (Type 542 Model 1): Same as NEG-1A (Model 3359-1).

NEG-2 (Type 542 Model 2): Same as NEG-1A (Model 3359-1). The engine of this unit has continuous rating of 4.25 h.p./4,000 r.p.m./sea level.



Lawrence, Series 3

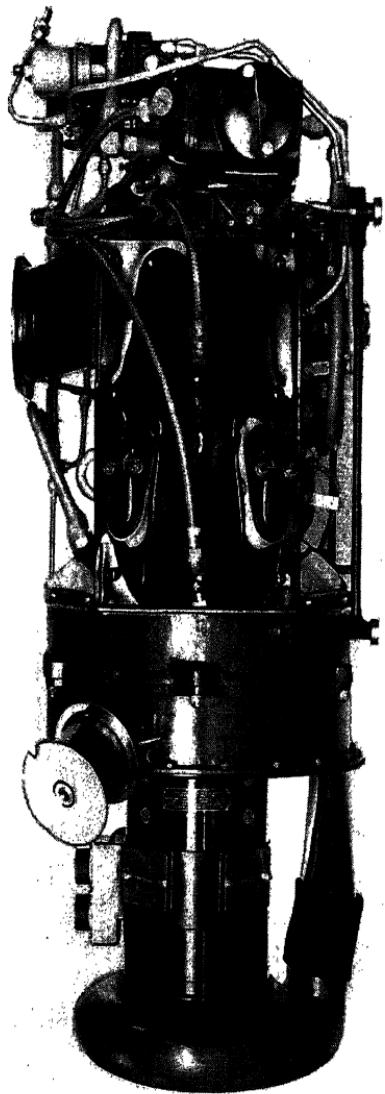
Lawrance, Series 30C

Country	United States of America.	
Model	30C-1.	
Type (engine)	2 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings.	
Supercharger	None.	
Carburation	1 Bendix-Stromberg NA-H1E carburetor with automatic mixture control.	
Ignition	2 Bendix-Scintilla SF2RN-10 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60 lb./sq.in. (4,2 kg/cm ²). Dry sump.	
Starter	Hand starter or motorizing generator.	
Bore	2.625 in.	67 mm
Stroke	2.75 in.	70 mm
Displacement	30 cu.in.	0,49 lit
Compression ratio	9.0:1	9,0:1
Width	30.0 in.	762 mm
Height	16.0 in.	406 mm
Length	36.0 in.	914 mm
Weight of unit (net)	213 lb.	97 kg
Weight/kw. output (cont.)	42.6 lb./kw.	19,3 kg/kw
Fuel consumption (cont.)	1.3 lb./kw./hr.	0,59 kg/kw/hr
Oil consumption (cont.)	0.06 lb./kw./hr.	28 g/kw/hr
Gasoline grade	87-100/130 grade	87-100/130 grade
Oil grade (viscosity) .....	.65-80 S.U. secs.	11,7 - 15,6 cs
Output/displacement	0.50 h.p./cu.in.	30,6 hp/lit
Output/piston area	1.40 h.p./sq.in.	0,21 hp/cm ²
Piston speed (max.)	1,879 ft./min.	9,6 m/sec
B.m.e.p. (max.)	99 lb./sq.in.	7,0 kg/cm ²
Rating (maximum)	15 h.p./4,000 r.p.m./sea level	
Rating (continuous)	10 h.p./4,000 r.p.m./sea level	
Rating (at altitude)	5.7 h.p./4,000 r.p.m./20,000 ft. (6 100 m)	
Output (overload)	7.5 kw. 28.5 v. D.C./sea level	
Output (continuous)	5.0 kw. 28.5 v. D.C./sea level	
Output (at altitude)	2.85 kw. 28.5 v. D.C./20,000 ft. (6 100 m)	

The engine is direct coupled to a 28.5 volt D.C. aircraft type electric generator. The unit is mounted horizontally in a soundproof enclosure. Cooling is by means of an axial-flow fan mounted on the generator armature. The remote control system is automatic and the engine is regulated by a mechanical governor. An automatic voltage regulator controls the electric power generated to suit the 24-volt system on the airplane.

30C-2: Same as 30C-1.

30C-4, 30C-5: Same as 30C-1 and 30C-2. For use at altitudes of not more than 10,000 ft. (3 000 m).



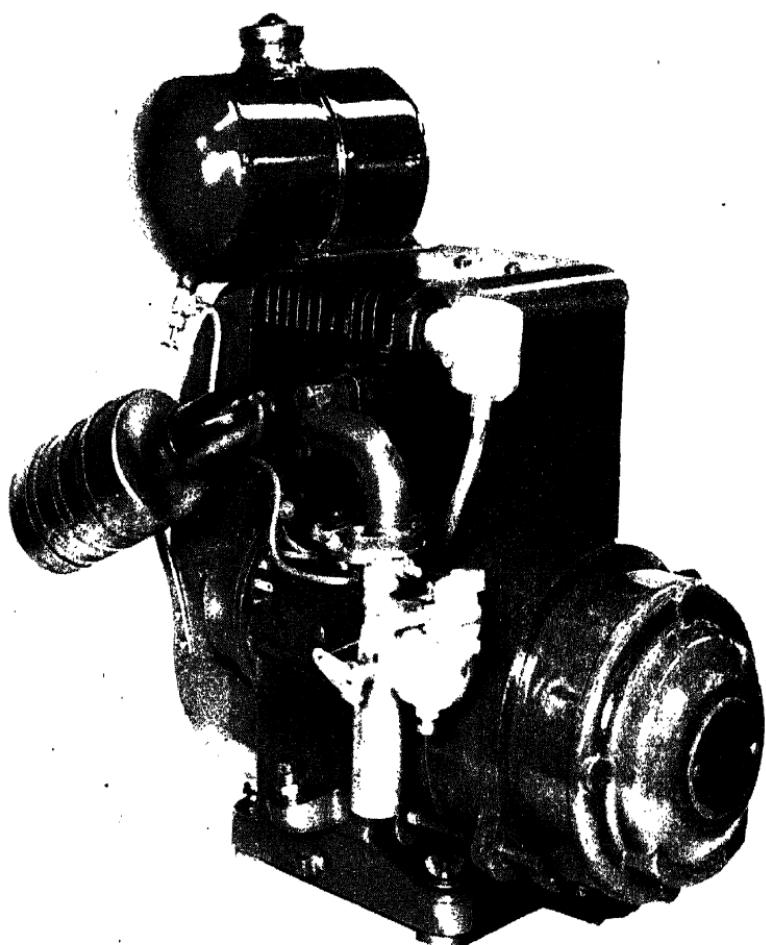
Pratt & Whitney, Series 30D

Lawrance, Series 30D

Country	United States of America.
Model	30D-1.
Type (engine)	2 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings.
Supercharger	None.
Carburation	1 Bendix-Stromberg NA-H1E carburetor with automatic mixture control.
Ignition	2 Bendix-Scintilla SF2RN-10 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 60 lb./sq.in. (4,2 kg/cm ²). Dry sump.
Starter	Hand starter.
Bore	2.625 in. 67 mm
Stroke	2.75 in. 70 mm
Displacement	30 cu.in. 4,9 lit
Compression ratio	9.0:1 9.0:1
Width	26.0 in. 660 mm
Height	16.0 in. 406 mm
Length	39.0 in. 991 mm
Weight of unit (net)	214 lb. 97 kg
Weight/kw. output (cont.)	42.8 lb./kw. 19,4 kg/kw
Fuel consumption (cont.)	1.2 lb./kw./hr. 0,54 kg/kw/hr
Oil consumption (cont.)	0.06 lb./kw./hr. 28 g/kw/hr
Gasoline grade	87-100/130 grade 87-100/130 grade
Oil grade (viscosity)	65-80 S.U. secs. 11,7 - 15,6 cs
Output/displacement	0.50 h.p./cu.in. 30,6 hp/lit
Output/piston area	1.40 h.p./sq.in. 0,21 hp/cm ²
Piston speed (max.)	1,879 ft./min. 9,6 m/sec
B.m.e.p. (max.)	99 lb./sq.in. 7,0 kg/cm ²
Rating (maximum)	15 h.p./4,100 r.p.m./sea level
Rating (continuous)	10 h.p./4,000 r.p.m./sea level
Rating (at altitude)	7.5 h.p./4,000 r.p.m./20,000 ft. (6 100 m)
Output (overload)	7 kw. 28.5 v. D.C./sea level
Output (continuous)	5 kw. 28.5 v. D.C./sea level
Output (at altitude)	2.5 kw. 28.5 v. D.C./20,000 ft. (6 100 m)

The engine is direct coupled to a 28.5 volt D.C. AAF P-1 aircraft type electric generator. The unit is mounted horizontally in a soundproof enclosure. Any generator having a standard 6.0 in. (152 mm) S.A.E. mounting flange can be used. Cooling is by means of a specially designed suction system. The remote control system is automatic and the engine speed is regulated by a mechanical governor. An automatic voltage regulator controls the electric power generated to suit either the 24-volt or the 120-volt system on the airplane.

30D: Similar to 30D-1. Constructed to utilize an Eclipse NEA-3 electric generator in addition to those used on the 30D-1 unit. No soundproof enclosure.



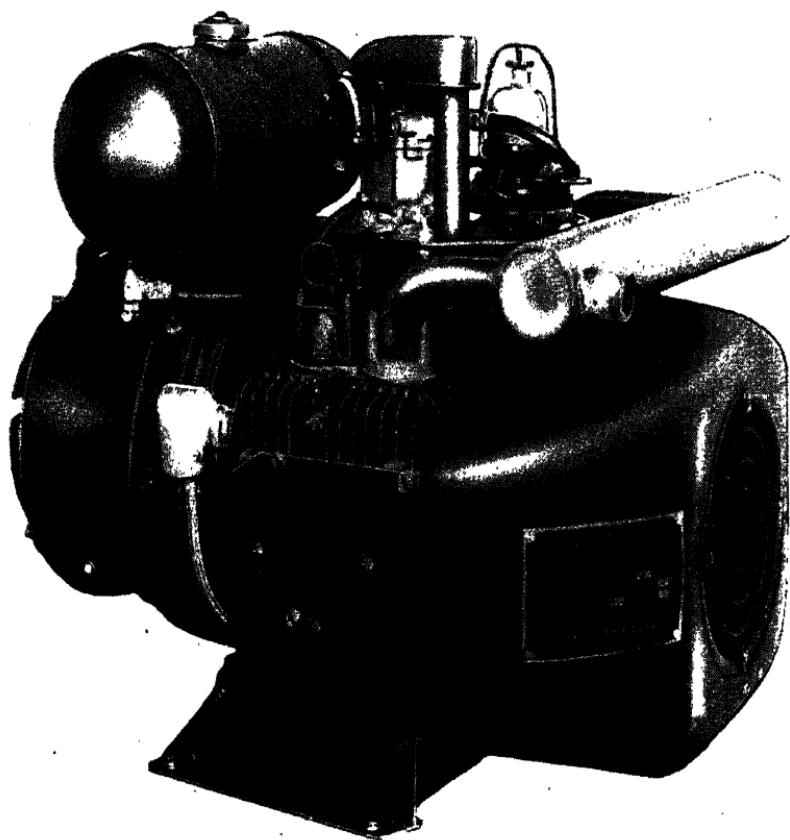
Onan, Series 1C

Onan, Series 1C

Country	United States of America.
Model	1C-68S.
Type (engine)	1 cylinder, vertical, air cooled, direct drive, not supercharged, 4-cycle.
Construction	1-piece aluminum alloy crankcase with separable end bearing plate. L-type aluminum alloy cylinder with cast iron liner and aluminum alloy head. 1 inlet valve and 1 exhaust valve actuated by tappets. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings.
Supercharger	None.
Carburation	1 Zenith 1A1M updraft carburetor.
Ignition	1 Onan 1C flywheel type magneto. 1 14-mm short reach spark plug. Shielded ignition system.
Lubrication	Pressure feed, 15 lb./sq.in. (1,0 kg/cm ²). Wet sump.
Starter	Hand or motorizing generator.
Bore	2.25 in. 57 mm
Stroke	2.25 in. 57 mm
Displacement	9 cu.in. 0,15 lit
Compression ratio	5.0:1 5,0:1
Width	10.5 in. 267 mm
Height	19.5 in. 496 mm
Length	16.0 in. 406 mm
Weight of unit (net)	62 lb. 28 kg
Weight/kw. output (cont.)	103 lb./kw. 47 kg/kw
Fuel consumption (cont.)	2.0 lb./kw./hr. 0,91 kg/kw/hr
Oil consumption (cont.)	0.03 lb./kw./hr. 14 g/kw/hr
Gasoline grade	73-100/130 grade 73-100/130 grade
Oil grade (viscosity)	40 S.U. secs. 4,3 cs
Output/displacement	0.21 h.p./cu.in. 12,7 hp/lit
Output/piston area	0.48 h.p./sq.in. 0,07 hp/cm ²
Piston speed (max.)	975 ft./min. 4,9 m/sec
B.m.e.p. (max.)	64 lb./sq.in. 4,5 kg/cm ²
Rating (maximum)	1.9 h.p./2,600 r.p.m./sea level
Rating (continuous)	1.1 h.p./2,200 r.p.m./sea level
Rating (at altitude)	0.9 h.p./2,200 r.p.m./10,000 ft. (3 000 m)
Output (overload)	0.72 kw. 24 v. D.C./sea level
Output (continuous)	0.60 kw. 24 v. D.C./sea level
Output (at altitude)	0.43 kw. 24 v. D.C./10,000 ft. (3 000 m)

The engine is direct connected to a 24-28 volt D.C. Onan electric generator. The unit is mounted horizontally. Cooling is by means of a centrifugal blower. Push button start and stop. The engine speed is regulated by a mechanical governor. The voltage is regulated by the battery being charged.

Note: The above data applies to one model of the series equipped with Onan 1C engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency, hand cranked and self-starting remote control. Standard ratings include 350, 400, 500 and 600 watts; 6-8, 12-15, 32-40 and 110 volts D.C.; 110 volts A.C.; 50, 60 and 400 cycles. Dimensions, weights and other data differ according to the model.



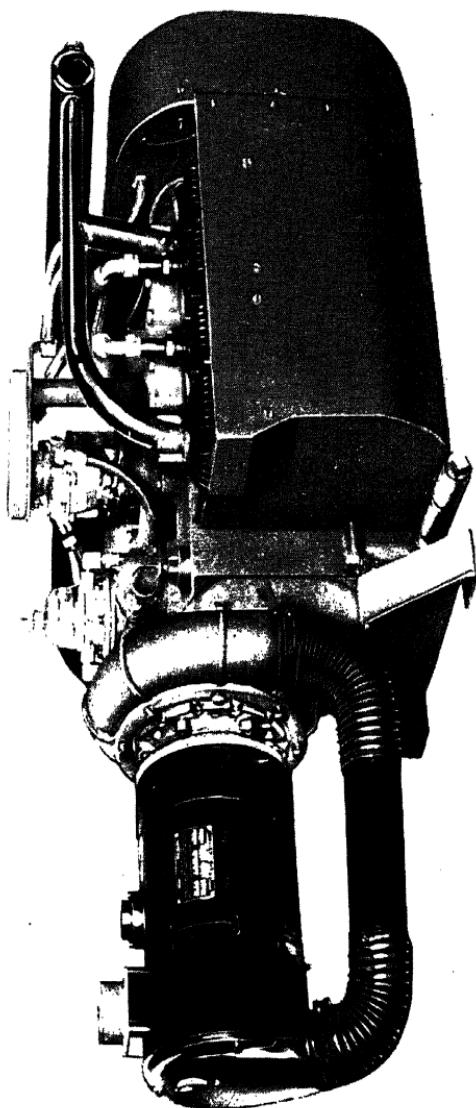
Onan, Series OTC

Onan, Series OTC

Country	United States of America.	
Model	OTC-80E.	
Type (engine)	2 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle.	
Construction	1-piece aluminum alloy crankcase with separable end bearing plate. L-type aluminum alloy cylinders with cast iron liners and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by tappets. 2-throw 1-piece crankshaft supported in 2 plain bearings.	
Supercharger.....	None.	
Carburation	1 Marvel-Schebler VD-10 downdraft carburetor with altitude compensator.	
Ignition	1 Onan OTC flywheel type magneto. 1 14-mm short reach spark plug per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 20 lb./sq.in. (1,4 kg/cm ²). Dry sump.	
Starter	Hand or motorizing generator.	
Bore	2.75 in.	70 mm
Stroke	2.25 in.	57 mm
Displacement	27 cu.in.	0.44 lit
Compression ratio.....	5.9:1	5.9:1
Width	18.0 in.	457 mm
Height	16.5 in.	418 mm
Length	23.0 in.	584 mm
Weight of unit (net)	113 lb.	51 kg
Weight/kw. output (cont.)	56.5 lb./kw.	21 kg/kw
Fuel consumption (cont.)	1.5 lb./kw./hr.	0.68 kg/kw/hr
Oil consumption (cont.)	0.03 lb./kw./hr.	14 g/kw/hr
Gasoline grade	73-100/130 grade	73-100/130 grade
Oil grade (viscosity)	60 S.U. secs.	10.3 cs
Output/displacement	0.20 h.p./cu.in.	12.0 hp/lit
Output/piston area	0.45 h.p./sq.in.	0.07 hp/cm ²
Piston speed (max.)	975 ft./min.	4.9 m/sec
B.m.e.p. (max.)	61 lb./sq.in.	4.3 kg/cm ²
Rating (maximum)	5.3 h.p./2,600 r.p.m./sea level	
Rating (continuous)	4.0 h.p./2,500 r.p.m./sea level	
Rating (at altitude)	3.5 h.p./2,500 r.p.m./10,000 ft. (3 000 m)	
Output (overload)	2.4 kw. 28.5 v. D.C./sea level	
Output (continuous)	2.0 kw. 28.5 v. D.C./sea level	
Output (at altitude)	1.3 kw. 28.5 v. D.C./10,000 ft. (3 000 m)	

The engine is direct connected to a 28.5 volt D.C. Onan electric generator. The unit is mounted horizontally. Cooling is by means of centrifugal blowers. Starting and stopping is by means of push button remote control. The engine speed is regulated by a mechanical governor. The voltage is controlled by an automatic voltage regulator.

Note: The above data applies to one model of a series equipped with Onan OTC engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency, hand cranked or self-starting remote control. Standard ratings include: 1,500 or 2,000 watts; 6-8, 12-15, 24-30, 38 and 115 volts D.C.; 80, 110 and 220 volts A.C.; 60, 180, 300, 400, 500 and 800 cycles; 1 and 3-phase. Dimensions, weights and other data differ according to the model.



Ona Series OFA

Onan, Series OFA

Country United States of America.

Model **OFA-90.**

Type (engine) 4 cylinders, horizontally opposed, air cooled, geared drive, not supercharged, 4-cycle.

Construction 1-piece aluminum alloy crankcase with separable end bearing plate. L-type cast iron cylinders with aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by tappets. 4-throw 1-piece crankshaft supported in 3 plain bearings.

Supercharger None.

Carburation 1 Marvel-Schebler VD-10 downdraft carburetor with altitude compensator.

Ignition 1 Auto-Lite IGW 4171-6X distributor and coil. 1 14-mm short reach spark plug per cylinder. Shielded ignition system.

Lubrication Pressure feed, 20 lb./sq.in. (1,4 kg/cm²). Dry sump.

Starter Motorizing generator.

Bore	2.75 in.	70 mm
Stroke	2.25 in.	57 mm
Displacement	.53 cu.in.	0.87 lit
Compression ratio	5.9:1	5.9:1
Width	18.0 in.	457 mm
Height	18.0 in.	457 mm
Length	37.0 in.	940 mm
Weight of unit (net)	200 lb.	91 kg
Weight/kw. output (cont.)	40.0 lb./kw.	18 kg/kw
Fuel consumption (cont.)	1.9 lb./kw./hr.	0.86 kg/kw/hr
Oil consumption (cont.)	0.04 lb./kw./hr.	18 g/kw/hr
Gasoline grade	73-100 130 grade	73-100/130 grade
Oil grade (viscosity)	60 S.U. secs.	10.3 cs
Output/displacement	0.25 h.p./cu.in.	15.5 hp/lit
Output/piston area	0.57 h.p./sq.in.	0.09 hp/cm ²
Piston speed (max.)	1,088 ft./min.	5.5 m/sec
B.m.e.p. (max.)	68 lb./sq.in.	4.8 kg/cm ²

Rating (maximum) 13.5 h.p./2,900 r.p.m./sea level

Rating (continuous) 11.7 h.p./2,800 r.p.m./sea level

Rating (at altitude) 9.2 h.p./2,800 r.p.m./10,000 ft. (3 000 m)

Rating (at altitude) 6.5 h.p./2,800 r.p.m./18,000 ft. (5 500 m)

Output (overload) 5.7 kw. 28.5 v. D.C./sea level

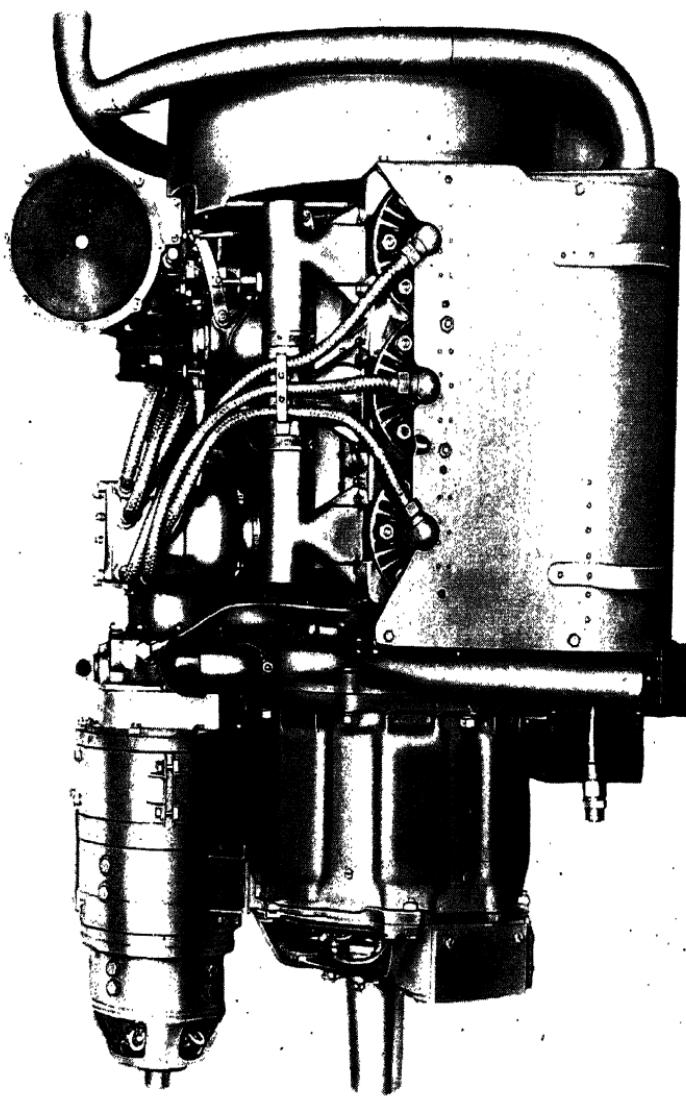
Output (continuous) 5.0 kw. 28.5 v. D.C./sea level

Output (at altitude) 3.0 kw. 28.5 v. D.C./10,000 ft. (3 000 m)

Output (at altitude) 2.0 kw. 28.5 v. D.C./18,000 ft. (5 500 m)

The engine is connected through a step-up gear to a 28.5 volt D.C. aircraft type electric generator. The unit is mounted horizontally. Cooling is by means of centrifugal blowers. Starting and stopping is by push button remote control. The engine speed is regulated by a mechanical governor. The voltage is controlled by an automatic voltage regulator.

Note: The above data applies to one model of a series equipped with Onan OFA engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency. Standard ratings include 24-30, 38 and 115 volts D.C.; 80, 110 and 220 volts A.C.; 60, 180, 300, 400, 500 and 800 cycles; 1 and 3-phase. Dimensions, weights and other data differ according to the model.



Ro Series P-6

Rotol, Series P-6

Country	Great Britain.	
Model	P-6.	
Type (engine)	6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and detachable aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 1-piece 6-throw crankshaft supported in 4 plain bearings and 1 ball bearing.	
Supercharger	None.	
Carburation	1 Zenith 48AGP downdraft carburetor with automatic altitude control compensating to 25,000 ft. (7 600 m).	
Ignition	1 Rotax BR2-6RAF magneto. Provision for 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 40-50 lb./sq.in. (2,8 - 3,5 kg/cm ²). Dry sump.	
Starter	Rotax CO-706 direct cranking electric starter.	
Bore	3.375 in.	86 mm
Stroke	3.00 in.	76 mm
Displacement	161 cu.in.	2,6 lit
Compression ratio	7.8:1	7,8:1
Width	28.0 in.	711 mm
Height	39.5 in.	1 003 mm
Length	42.7 in.	1 086 mm
Weigh of unit (net) .....	.500 lb.	227 kg
Weight/kw output (cont.)	21.3 lb./kw.	9,7 kg/kw
Fuel consumption (cont.)	0.92 lb./kw./hr.	0,42 kg/kw/hr
Oil consumption (cont.)	0.04 lb./kw./hr.	18 g/kw/hr
Gasoline grade	87-100/130 (D.T.D. 230- D.E.D. 2475)	87-100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20,5 cs
Output/displacement	0.60 h.p./cu.in.	36,9 hp/lit
Output/piston area	1.77 h.p./sq.in.	0,27 hp/cm ²
Piston speed (max.)	2,125 ft./min.	10,8 m/sec
B.m.e.p. (max.)	112 lb./sq.in.	7,9 kg/cm ²
Rating (maximum)	96 h.p./4,250 r.p.m./sea level	
Rating (normal)	60 h.p./3,750 r.p.m./sea level	
Rating (at altitude)	60 h.p./3,750 r.p.m./12,000 ft. (3 700 m)	
Output (overload)	32 kw. 110 v. A.C. and 4.8 kw. 29 v. D.C.	
Output (continuous)	20 kw. 110 v. A.C. and 3.5 kw. 29 v. D.C.	
Output (at altitude)	20 kw. 110 v. A.C. and 3.5 kw. 29 v. D.C./12,000 ft. (3 700 m)	

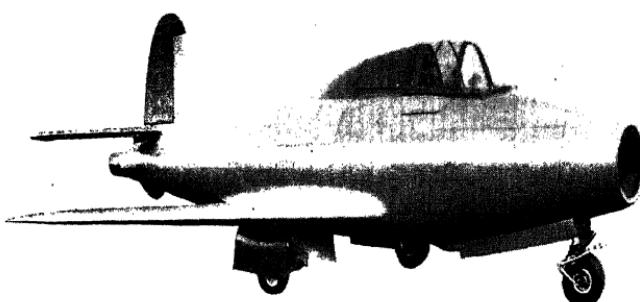
The engine is direct coupled to a 110-volt A.C. alternator and it also drives a 29-volt D.C. electric generator through a step-up gear, ratio 1:1.23. The unit is mounted horizontally in a fireproof and soundproof enclosure. Cooling is by means of a multivane centrifugal fan and ducts with baffles around the cylinders. Starting is by means of an electric starter, with emergency hand crank. The engine speed is regulated by a centrifugal-type governor connected to the carburetor. The voltages are controlled by automatic voltage regulators to suit the circuits on the airplane. The unit is fully automatic in operation.

JET PROPULSION

Among the new types of aircraft power plants which are now beginning to make their appearance, jet propulsion engines are attracting considerable attention. Fundamentally, jet engines utilize the reaction thrust resulting from the ejection of gases at high velocity for the propulsion of the aircraft in which they are installed. There are two basic types of jet engines:

1. The atmospheric-type jet engine which depends upon the surrounding atmosphere for the oxygen required for the combustion of its fuel.
2. The rocket-type jet engine which functions independently of the atmosphere by carrying its own oxygen supply for the combustion of its fuel.

The cyclic functioning and reaction thrust in these engines may be continuous (as in the gas turbine jet engine and the rocket jet engine), or intermittent (as in the impulse jet engine used in robot flying bombs).



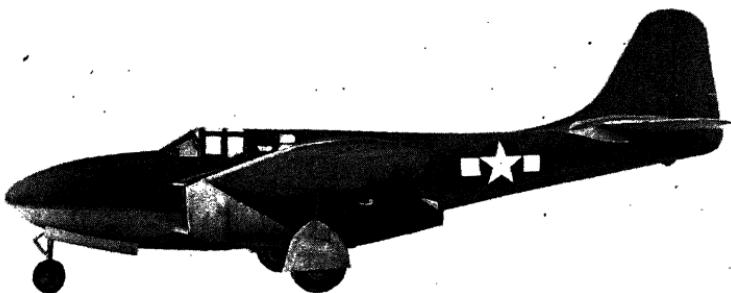
BRITISH R.A.F. GLOSTER 1-JET FIGHTER

The first flight with an atmospheric-type jet engine was made in August, 1940, when an Italian Caproni-Campini CC-2 jet-propelled airplane remained in the air for 10 minutes. The Campini jet engine differed from present-day practice in that a 400 h.p. air-cooled radial aircraft engine was used to drive the compressor.

The first atmospheric-type jet engine embodying a turbine operated by combustion gases for driving the compressor, as is now common practice, was invented by Air Commodore Frank Whittle, R.A.F., in England. He was associated with Power Jets Limited. The British

Thomson-Houston Company Ltd. built the first experimental Whittle jet engine in 1936, and it ran successfully on the test bed in 1937. It was first flown in May, 1941, in a Gloster E28/39 experimental 1-jet fighter built for the Royal Air Force. British jet-propelled fighters are now in service, one of the latest being the Gloster Meteor powered with 2 Rolls-Royce jet engines embodying basic Whittle designs.

The first atmospheric-type jet engine built in the United States was of Whittle design. In 1941, arrangements were made for a Whittle jet engine to be supplied to the General Electric Company (U.S.A.) and a year later G-E jet engines were in production here. General Electric jet engines were used in the Bell P-59A Airacomet 2-jet fighter built for the U.S. Army Air Forces when it made its initial flight in October,



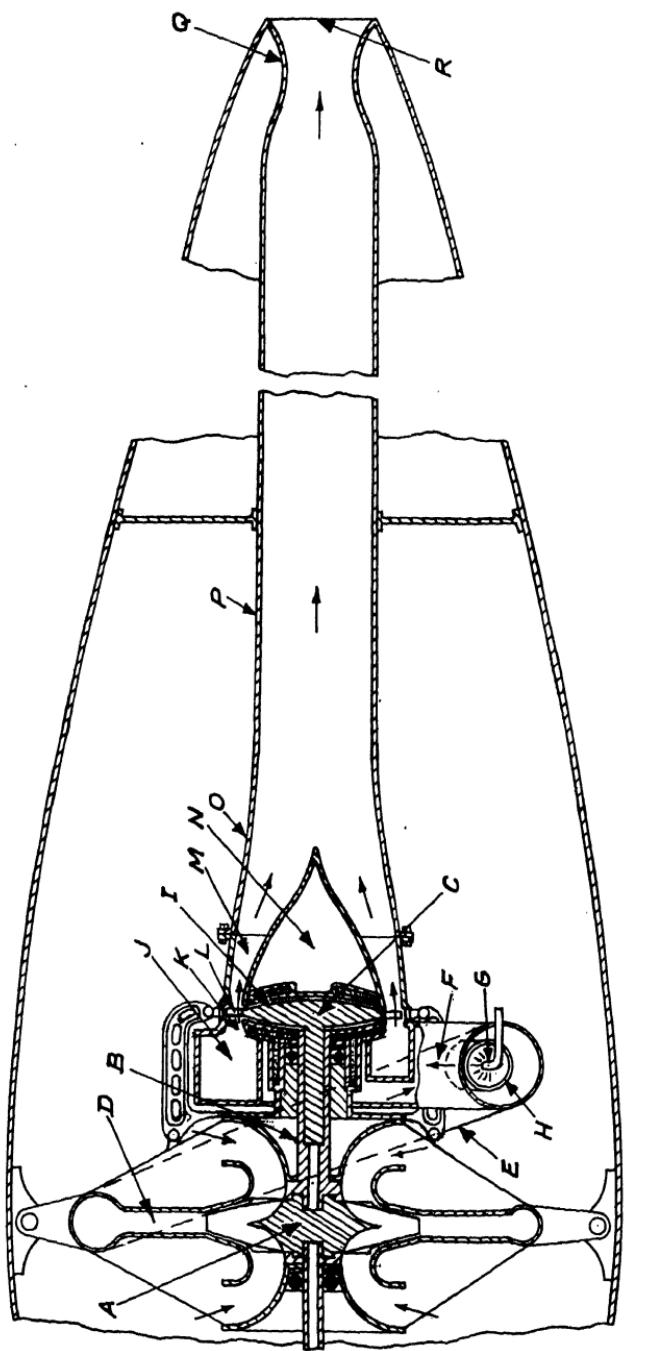
COURTESY U.S. AIR FORCES

UNITED STATES A.A.F. BELL 2-JET FIGHTER

1942. G-E jet engines of improved design and increased performance are used in the new A.A.F. Lockheed P-80 Shooting Star 1-jet fighter which is in mass production in the United States.

Atmospheric-type jet engines of German origin made their appearance in robot flying bombs in June, 1944, and in this instance the engines were of the impulse jet or intermittent reaction thrust variety. They were followed in the Summer of 1944 by full-size piloted aircraft such as the 2-jet Arado 234, the 2-jet Heinkel He 280 and the 2-jet Messerschmitt Me 262 Schwalbe (Swallow) fighter bombers equipped with gas turbine jet engines of B.M.W. or Junkers design.

Rocket-type jet engines are used by the Germans in their 1-jet Messerschmitt Me 163 Komet (Comet) flying wing interceptors. These rocket planes display phenomenal bursts of speed but their supply of fuel and oxygen is limited and consequently their flight duration is very short and they have to glide during most of their time in the air. The Germans use rocket-type jet engines burning a mixture of liquid air and oxygen or alcohol in their V-2 long-range rocket bombs.



Whittle Jet Propulsion Engine

Country: Great Britain.

The Whittle jet propulsion engine consists of four main components—a centrifugal compressor, a combustion chamber, a gas turbine for driving the compressor, and a tail tube with an exhaust nozzle. A sectional view of one form of this jet engine is shown on the opposite page. The compressor is of the double entry type with two intakes—one on each side of the impeller A. The impeller is mounted on the same shaft B as the turbine rotor C and it is driven at high speed by the latter so that a high mass-flow of air is obtained with the air leaving the tips of the impeller blades at super-sonic velocity.¹ Subsequently, the air speed is reduced to sub-sonic velocity by passing it through a primary diffuser chamber D and a delivery scroll E of increasing cross-section area.

The combustion chamber F into which the air passes from the delivery scroll is in the form of a relatively large helix with tapered ends of smaller cross-section area than the center portion. Low grade fuel such as kerosene is injected into the center portion through a nozzle G surrounded by a tubular cowl H with an inner wall of perforated metal or wire mesh which reduces the speed of the air adjacent to the nozzle and ensures continuous combustion. Only a small portion of the air is used for combustion and the remainder mingles with the combustion gases so that it is highly heated as well as moving at high velocity at constant pressure when it leaves the combustion chamber.

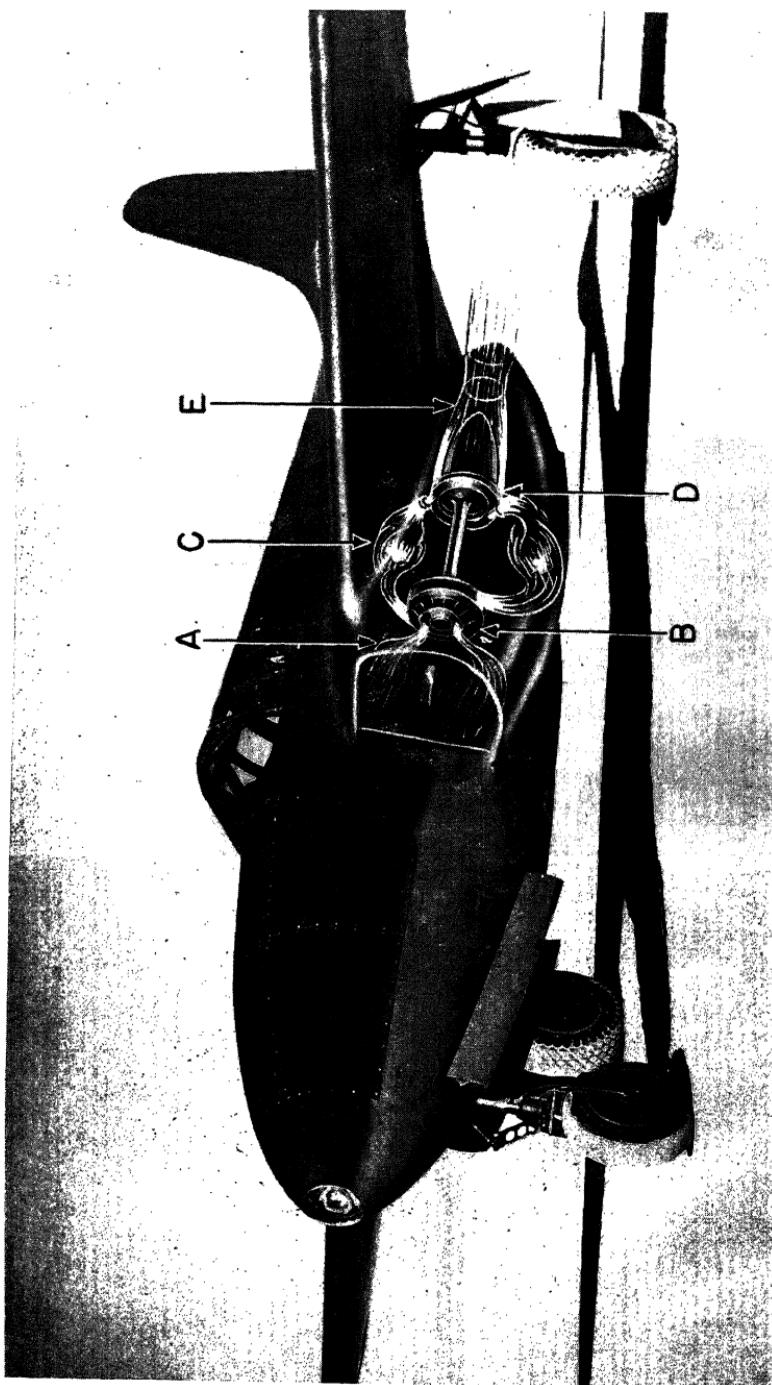
The turbine I is of the single-stage type with an annular intake chamber J and a single nozzle K extending almost completely around the periphery so that the rotor blades L are in the gas blast at all times. The turbine exhausts into a divergent channel M located between the cone N on the turbine casing and the discharge conduit O. In passing through the turbine, the highly heated air and gases give up a portion of their energy to drive the turbine and the compressor.

The tail tube P connected to the discharge conduit has a venturi-shaped throat Q which gives final impetus to the highly heated air and gases rushing at high velocity through the exhaust nozzle R into the atmosphere at the rear of the fuselage or engine nacelle.

The accessories such as the fuel injection pump and the lubricating oil pump are mounted on the compressor cover where they are driven through reduction gears. Control of the gas blast and the reaction thrust is accomplished by varying the quantity of fuel injected which in turn affects the speed of the turbine and the compressor.

Jet propulsion engines of basic Whittle design are now manufactured by several firms in England including the British Thomson-Houston Company Ltd., the De Havilland Aircraft Company Ltd., and Rolls-Royce Limited.

¹ The speed of sound is 1,126 ft./sec. (343 m/sec), or 768 m.p.h. (1,236 km/h) at 68° F. (20° C) at sea level.



General Elec

Bell P-59A

Propulsion Eng

Tracomei

General Electric Jet Propulsion Engine

Country: United States of America.

The General Electric jet propulsion engine now in production is similar to the Whittle jet engine developed in England. An installation of two G-E jet engines in a Bell Airacomet P-59A 2-jet fighter of the Army Air Forces is shown on the opposite page. In the diagrammatic view of one of the engines, A is the air intake, B is the air compressor, C is the combustion chamber, D is the gas turbine, E is the tail tube.

The engine is started by means of an electric motor mounted in front of the compressor which rotates the latter's impeller until sufficient pressure is attained. When the power plant has been accelerated to starting speed, fuel is injected into the combustion chamber, where it is ignited by an electric spark. As soon as combustion is initiated, the starting motor and ignition system are shut off, and the heated air and combustion gases run the turbine, and with it, the compressor. Full thrust is available in a matter of seconds after combustion has commenced. The engine runs on kerosene and, when properly regulated, no visible flames come out of the tail pipe.

Heating of the air-flow from the compressor is obtained by passing the air through combustion chambers. Fuel ignition by spark plugs is required only during starting. Once started, combustion in each of the chambers is maintained by a continuous flow of fuel and air.

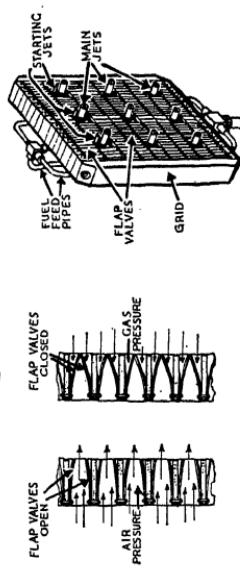
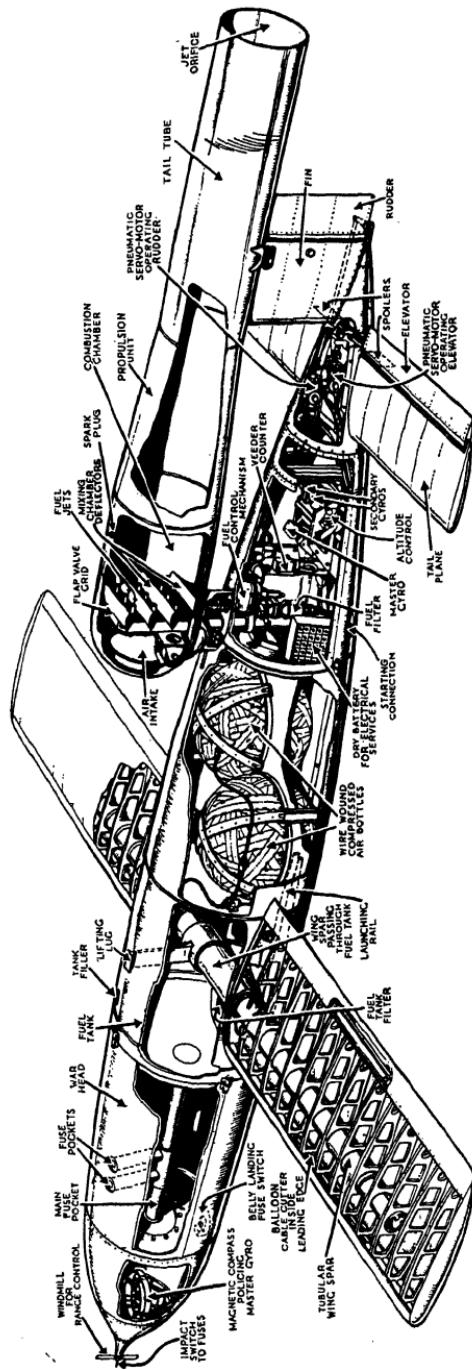
The lubrication system is quite simple, as it is only necessary to ensure that the impeller-turbine rotor shaft bearings and the accessory drive gears are properly lubricated. Forced-feed lubrication is used, and the excess lubricating oil is returned by a small scavenging pump and passed through a cleaning filter. Standard light engine oils are used as lubricants.

Removal of the engine from the airplane is a simple matter. Only a few connections have to be broken—the fuel line, the lubricating oil lines, the tachometer and electric generator lines, the starter lines, and the thermocouple leads to the tail tube and the main impeller-turbine rotor shaft bearing.

When in flight, the speed of the engine at various altitudes is maintained constant by means of altitude-compensating fuel controls, as the speed of the unit depends upon the amount of fuel it receives and the temperature and density of the air entering the compressor. The pilot can check the functioning of the jet engine by comparing the tail tube temperature against the r.p.m., just as he would check the manifold pressure against the r.p.m. of a reciprocating-type engine.

The G-E jet propulsion engine functions powerfully and smoothly at extremely high altitudes. Fighting planes equipped with it have top speeds approaching the speed of sound.

The latest G-E jet engine used in the new Lockheed P-80 Shooting Star 1-jet fighter of the U.S. Army Air Forces has an estimated output of approximately double that of the earlier engine used in the Bell Airacomet P-59A fighter.



V-1 Jet Propulsion Engine on German Robot Flying Bomb

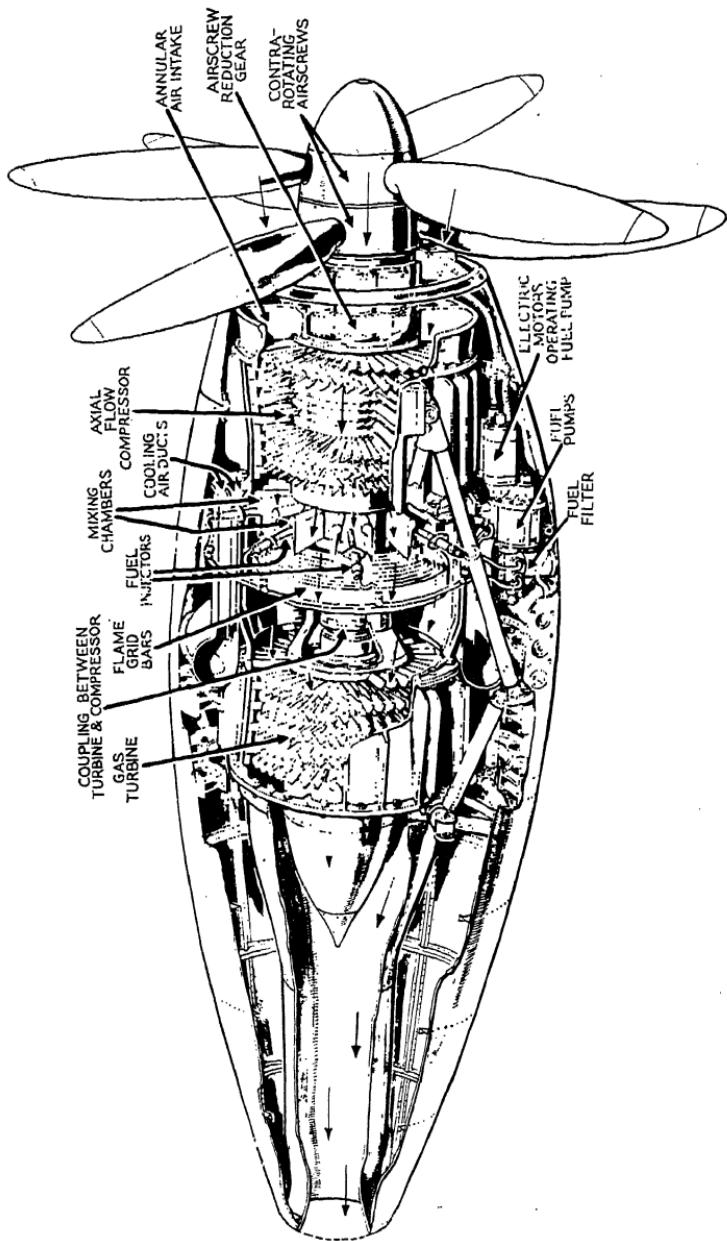
Length of airplane and engine	25.4 ft. (7,742 m)
Length of fuselage alone	21.5 ft. (6,553 m)
Diameter of fuselage (max.)	2.7 ft. (0.823 m)
Wing span	17.6 ft. (5,365 m)
Wing area	.51 sq. ft. (4.7 m ²)
Wing loading	.93 lb./sq. ft. (3.8 kg/m ²)
Total weight	4,750 lb. (2,155 kg)
Power loading	.82 lb. (3.7 kg) / thrust h.p.
Normal engine rating	575 thrust h.p.

V-1 Jet Propulsion Engine

Country	Germany.
Model	V-1 (Vergeltungswaffe 1).
Type	Atmospheric type, intermittent reaction thrust.
Construction	Tubular welded sheet steel combustion chamber and tail tube. Air intake grille with 126 non-return flap valves each equipped with 2 flexible steel flaps. 4 horizontal aerofoil type deflectors behind grille to direct air flow close to fuel injection nozzles to aid combustion.
Air compressor	None. Ram effect in flight compresses air to more than atmospheric pressure.
Gas turbine	None.
Injection	Direct fuel injection through 9 nozzles or atomizers in 3 horizontal rows behind air intake grille. Fuel injection pressure of 100 lb./sq.in. (7,0 kg/cm ²) obtained from compressed air bottles with reduction valves in airplane fuselage. Automatic fuel control regulated by air pressure in pitot tube on airplane when in flight.
Ignition	Residual flame of combustion of previous charge.
Starting	Compressed air (from external source) is admitted into combustion chamber through 3 small nozzles adjacent to the 3 upper fuel nozzles through which fuel is also injected into combustion chamber. Mixture is ignited by spark plug in combustion chamber and cyclic functioning commences.
Cyclic functioning	<ol style="list-style-type: none"> 1. Intake: Air passes through intake valves in grille into combustion chamber. 2. Compression: Air is compressed by ram effect, and fuel is injected and ignited by residual flame of combustion of previous charge. 3. Combustion and expansion: Fuel burns and gas pressure created in combustion chamber closes flaps on air intake valves. 4. Reaction thrust and exhaust: Gas pressure imparts forward reaction thrust to engine unit while burnt gases leave combustion chamber through tail tube. Pressure inside combustion chamber drops below atmospheric permitting flaps on air intake valves to open admitting air for succeeding cycle of operation.
Diameter (max.)	23.0 in. 584 mm
Length	135.0 in. 3 430 mm
Frontal area	2.9 sq.ft. 0,27 m ²
Weight (approx.)	250 lb. 113 kg
Weight/thrust h.p.	0.43 lb./t.h.p. 0,19 kg/thp
Fuel consumption	4.51 lb./t.h.p./hr. 2,04 kg/thp/hr
Fuel grade	73 octane gasoline 73 octane gasoline
Impulse frequency/sec.	45 i.p.s. 45 i/s
M.e.p. thrust	600 lb./sq.in. 42,1 kg/cm ²
Rating (normal)	¹ 575 t.h.p./45 i.p.s./2,000 ft. (900 m)

Note: The above figures are based on the assumption that this jet engine is installed on the robot flying bomb illustrated on the opposite page, flying at a normal speed of 360 m.p.h. (580 km/h) at an altitude of 2,000 ft. (900 m) and with a fuel consumption of 0.833 U.S. gal. (1 Imp. gal. or 4,55 lit) per mile.

¹575 thrust h.p. from this jet engine is equivalent to approximately 725 brake h.p. from a reciprocating type aircraft engine and propeller.



COURTESY FLIGHT. ARTIST-MAX MILLAR

Gas Turbine - Jet Propulsion Power Plant

The Gas Turbine

Country: Great Britain.

Although a gas turbine and an air compressor are considered essential components for producing thermal energy for jet propulsion, these two components can also be used together for producing mechanical energy for driving a conventional propeller. In the case of jet propulsion, the compressor is of paramount importance and the turbine is merely the means for driving the compressor so that the latter will produce the high mass-flow of air required for reaction propulsion. When the turbine's chief function becomes that of driving a propeller, however, the relative importance of the two components is reversed. The turbine then becomes of paramount importance and the compressor's function becomes that of a supercharger to supply the air needed for combustion and production of gases to drive the turbine. Full use is then made of the mechanical thrust produced and the thermal thrust of the exhaust is merely incidental, as in the case of a conventional reciprocating type engine with ejector type exhaust stacks.

A cut-away view of a gas turbine unit proposed by G. Geoffrey Smith, M.B.E., in England, is shown on the opposite page. The turbine is of the multi-stage type and the axial flow compressor is placed in front of it for aerodynamic reasons. The drive shaft connecting the rotor of the turbine and the impeller of the compressor extends forward and drives the two concentric propeller shafts for the two contra-rotating propellers through planetary spur reduction gears. The exhaust from the turbine is directed straight back so that it creates a jet propulsion effect.

In operation, air enters the compressor through an annular intake around the front of the unit. After being compressed, the air passes from the last stage of the compressor directly into the mixing chambers into which the fuel is injected. There the mixture ignites and the combustion gases rush back through the concentric flame grid bars which ensure even combustion, into the turbine. In the turbine, most of the energy of the combustion gases is absorbed to drive the rotor and with it, the propellers and the compressor. The exhaust gases from the turbine pass through a tail tube and a venturi-shaped nozzle into the atmosphere and the forward reaction thrust thus produced provides additional propulsive power.

This type of power plant in which propeller propulsion is combined with jet propulsion with a gas turbine providing the motive power, should have a definite future in aviation. At take-off and at low speeds when the airplane is climbing, the jet propulsion effect would not be appreciable due to the low air velocity at the air intakes and the low mass air flow from the compressor or supercharger. The propellers would be operating at high efficiency under these conditions, however, and they would take up the load. When the speed of the airplane increased after its operational altitude had been attained, the increased air velocity at the compressor intakes would enable a substantial jet propulsion effect to be utilized from the turbine exhaust.

United States of America

Make	Model	Type	Displacement	T.O.	Rated H.P.	Fuel Grade
			Cu. in.	Liters	H.P.	and Rated Altitude
*Allison	V-1710-E11	12-V2-L-G-SV2	1710	28,0	1325	1150/22,400 ft. (6 800 m)
*Allison	V-1710-E19	12-V2-L-G-S1	1710	28,0	1200	1125/15,500 ft. (4 700 m)
*Allison	V-1710-F17	12-V2-L-G-S1T	1710	28,0	1425	1425/27,000 ft. (8 200 m)
*Allison	V-1710-F30	12-V2-L-G-S1T	1710	28,0	1475	1475/30,000 ft. (9 100 m)
*Allison	V-3420-A16	24-V4-L-G-S1T	3420	55,0	2600	2600/25,000 ft. (7 600 m)
*Continental	A-65-8	4-O2-A-D-NS	171	2,8	65	65/sea level
*Continental	C-75-12	4-O2-A-D-NS	188	3,1	75	75/sea level
*Continental	C-140-1	6-O2-A-G-NS	232	4,6	140	140/sea level
Continental	I-1430	12-A2-L-G-S1T	1425	23,3	2100	NA
*Continental	W-670-M	7-R1-A-D-NS	668	10,9	240	240/sea level
*Franklin	4AC-176-BA2	4-O2-A-D-NS	176	2,9	65	65/sea level
*Franklin	6AC-298-E3	4-O2-A-G-NS	298	4,9	160	160/sea level
*Franklin	6ACV-298	6-O2-A-D-NS	298	4,9	160	160/sea level
*Franklin	6ACV-403	6-O2-A-D-NS	403	6,6	245	245/sea level
*General Motors	X-250-D	8-X4-L-D-GB	250	4,1	200	200/sea level
*Guliberson	A-1020	9-R1-A-D-NS	1021	16,7	310	310/sea level
*Jacobs	R-755	7-R1-A-D-NS	757	12,4	245	225/sea level
*Jacobs	R-915	7-R1-A-D-NS	914	15,0	330	300/sea level
*Kinney	B-54	5-R1-A-D-NS	441	7,2	125	125/sea level
*Kinney	K-52	5-R1-A-D-NS	372	6,1	100	100/sea level
*Kinney	R-56	5-R1-A-D-NS	540	8,8	160	160/sea level
*Lycoming	GO-145-C4	4-O2-A-G-NS	144	2,4	75	75/sea level
*Lycoming	O-235-B	4-O2-A-D-NS	233	3,8	100	100/sea level
*Lycoming	O-290-C	4-O2-A-D-NS	289	4,7	130	125/sea level
*Lycoming	GO-435-B	4-O2-A-G-NS	434	7,5	220	220/sea level
*Lycoming	O-435-D	4-O2-A-D-NS	434	7,5	212	212/sea level
*Lycoming	R-680-E3	9-R1-A-D-GB	680	11,1	300	285/sea level
*Packard	V-1650-1	12-V2-L-G-S2	1649	27,0	1300	1120/18,500 ft. (5 600 m)
*Packard	V-1650-3	12-V2-L-G-S22	1649	27,0	1380	1210/25,800 ft. (7 900 m)
*Packard	V-1650-7	12-V2-L-G-S22	1649	27,0	1490	1370/21,400 ft. (6 500 m)
*Pratt & Whitney	R-985 SB3	9-R1-A-D-S1	985	16,1	450	450/3,500 ft. (1 100 m)
*Pratt & Whitney	R-1340 S3H1-G	9-R1-A-G-S1	1344	22,0	600	600/3,000 ft. (900 m)
*Pratt & Whitney	R-1830 S3C4-G	14-R2-A-G-S2	1830	30,0	1200	1050/13,100 ft. (4 000 m)
*Pratt & Whitney	R-1830 SSC7-G	14-R2-A-G-S22	1830	30,0	1200	1100/17,500 ft. (5 300 m)
*Pratt & Whitney	R-2000 2SD-G	14-R2-A-G-S2	2000	32,7	1450	1100/16,000 ft. (4 900 m)
*Pratt & Whitney	R-2800 2SG-G	18-R2-A-G-S2	2804	45,9	2000	1600/18,500 ft. (4 100 m)
*Pratt & Whitney	R-2800 SSB2-G	18-R2-A-G-S22	2804	45,9	2000	1650/22,500 ft. (6 800 m)
*Ranger	6-440C-5	6-L1-A-D-NS	441	7,2	200	200/sea level
*Ranger	SGV-770C-1B	12-A2-A-G-S1	773	12,7	520	520/12,000 ft. (3 700 m)
*Ranger	SGV-770D-5	12-A2-A-G-S1	773	12,7	700	600/8,000 ft. (2 400 m)
*Warner	Scarab 50	7-R1-A-D-NS	422	6,9	131	125/sea level
*Warner	Super Scarab 165	7-R1-A-D-NS	499	9,1	175	165/sea level
*Warner	Super Scarab 185	7-R1-A-D-NS	555	9,1	200	175/sea level
*White	R-275S	5-R1-A-D-NS	266	4,3	115	115/sea level
*Wright	R-760 E2	7-R1-A-D-GB	756	12,4	350	320/sea level
*Wright	R-975-E3	9-R1-A-D-S1	973	15,9	450	420/1,400 ft. (400 m)
*Wright	R-1300 C7BA1	7-R1-A-G-S2	1300	21,3	700	500/17,000 ft. (5 200 m)
*Wright	R-1820 C9GC	9-R1-A-G-S2	1823	29,9	1200	900/15,200 ft. (4 800 m)
*Wright	R-1820 C9HC	9-R1-A-G-S2	1823	29,9	1350	1000/17,500 ft. (5 300 m)
*Wright	R-2600 C14BB	14-R2-A-G-S2	2603	42,7	1900	1450/15,000 ft. (4 600 m)
*Wright	R-3350 C18BA2	18-R2-A-G-S2	3347	54,9	2200	1800/14,000 ft. (4 300 m)

Abbreviations Used in Tabulations

A = Air cooled. D = Direct drive. DF = Diesel fuel. G = Geared drive. GB = Ground blower (gear driven). H4 = H cylinder arrangement (4 banks vertical). L = Liquid cooled. L1 = In-line cylinder arrangement (1 bank). NA = Not available. NS = Not supercharged. O2 = Opposed cylinder arrangement (2 banks horizontal). O4 = Opposed cylinder arrangement (4 banks horizontal). R1 = Radial cylinder arrangement (1 row). R2 = Radial cylinder arrangement (2 rows). R7 = Radial cylinder arrangement (7 rows). S1 = Supercharged (gear-driven 1-speed 1-stage). S2 = Supercharged (gear-driven 2-speed 1-stage). S22 = Supercharged (gear-driven 2-speed 2-stage). SIT = Supercharged (gear-driven 1-speed 1-stage with turbo-supercharger). SV1 = Supercharged (gear-driven variable-speed 1-stage). SV2 = Supercharged (gear-driven variable-speed 2-stage). V2 = V cylinder arrangement (2 banks). V4 = Double V cylinder arrangement (4 banks). X4 = X cylinder arrangement (4 banks). A2 = Inverted V cylinder arrangement (2 banks). A4 = Inverted double V cylinder arrangement (4 banks).

*This engine is illustrated and described in complete detail in the standardized data section of this book.

Great Britain

Make	Model	Type	Displacement	T.O.	Rated H.P.	Fuel Grade
			Cu. in. Liters	H.P.	and Rated Altitude	
*Alvis	Leonides	9-R1-A-D-S1	719 11.8	450	435/8,250 ft. (2 500 m)	87
*Armstrong Siddeley	Cheetah XV	7-R1-A-G-S1	835 13.7	420	400/4,000 ft. (1 200 m)	87
*Armstrong Siddeley	Tiger VIII	14-R2-A-G-S2	1996 32.7	920	780/14,250 ft. (4 300 m)	87
Bristol	Mercury XV, 25	9-R1-A-G-S1	1520 24.9	725	840/14,000 ft. (4 300 m)	87
*Bristol	Mercury XV, 25	9-R1-A-G-S1	1520 24.9	905	995/9,250 ft. (2 800 m)	100/130
Bristol	Mercury XX	9-R1-A-G-S1	1520 24.9	820	870/4,500 ft. (1 400 m)	87
Bristol	Mercury 30	9-R1-A-G-S1	1520 24.9	950	995/18,000 ft. (5 500 m)	100/130
Bristol	Pegasus XVIII	9-R1-A-G-S2	1753 28.7	965	885/15,500 ft. (4 700 m)	87
*Bristol	Pegasus XVIII	9-R1-A-G-S2	1753 28.7	1050	965/13,000 ft. (4 000 m)	100/130
*Bristol	Perseus XVI	9-R1-A-G-S1	1520 24.9	905	955/5,000 ft. (1 500 m)	87
*Bristol	Taurus XII	14-R2-A-G-S1	1550 25.4	1085	1130/3,500 ft. (1 100 m)	100/130
Bristol	Hercules XI	14-R2-A-G-S2	2360 38.7	1560	1460/9,500 ft. (2 900 m)	100/130
*Bristol	Hercules XVI	14-R2-A-G-S2	2360 38.7	1615	1455/12,000 ft. (3 700 m)	100/130
Bristol	Hercules XVII	14-R2-A-G-S1	2360 38.7	1725	1735/500 ft. (150 m)	100/130
Bristol	Hercules XVIII	14-R2-A-G-S2	2360 38.7	1725	1585/8,000 ft. (2 400 m)	100/130
Bristol	Centaurus	18-R2-A-G-S2	3270 53.6	2000	NA	100/130
*Cirrus	Minor I	4-L1-A-D-NS	220 3.6	90	82/sea level	73
*Cirrus	Minor II	4-L1-A-D-NS	243 4.0	100	90/sea level	73
*Cirrus	Major I	4-L1-A-D-NS	386 6.3	150	138/sea level	73
† De Havilland	Gipsy Minor	4-L1-A-D-NS	229 3.8	90	80/sea level	73
*De Havilland	Gipsy Major I	4-L1-A-D-NS	374 6.1	130	120/sea level	73
*De Havilland	Gipsy Six II	6-L1-A-D-NS	500 9.2	210	185/sea level	80
*De Havilland	Gipsy Six IIIS	6-L1-A-D-S1	622 10.2	285	265/7,000 ft. (2 100 m)	87
† De Havilland	Gipsy Twelve	12-A2-A-G-S1	1121 18.4	525	425/7,500 ft. (2 300 m)	87
*Napier	Dagger VIII	24-H4-A-G-S1	1027 16.8	955	1000/8,750 ft. (2 700 m)	87
*Napier	Sabre IIA	24-04-L-G-S2	2240 36.7	2200	NA	100/130
Napier	Sabre IIB	24-04-L-G-S2	2240 36.7	2400	NA	100/130
*Rolls-Royce	Peregrine I	12-V2-L-G-S1	1298 21.2	765	980/12,000 ft. (3 700 m)	100/130
*Rolls-Royce	Vulture I	24-X4-L-G-S2	2592 42.4	2010	1710/15,000 ft. (4 600 m)	100/130
Rolls-Royce	Merlin X	12-V2-L-G-S2	1649 27.0	1075	1010/17,750 ft. (5 400 m)	87
*Rolls-Royce	Merlin XX	12-V2-L-G-S2	1649 27.0	1280	1480/12,500 ft. (3 800 m)	100/130
*Rolls-Royce	Merlin 45	12-V2-L-G-S1	1649 27.0	1185	1515/11,000 ft. (3 400 m)	100/130
*Rolls-Royce	Merlin 61	12-V2-L-G-S22	1649 27.0	1390	1390/23,500 ft. (7 200 m)	100/130
*Rolls-Royce	Merlin 63, 63A	12-V2-L-G-S22	1649 27.0	1650	NA	100/130
Rolls-Royce	Merlin 72, 73	12-V2-L-G-S22	1649 27.0	1750	NA	100/130
*Rolls-Royce	Griffon IV	12-V2-L-G-S2	2240 36.7	1750	NA	100/130
*Rolls-Royce	Griffon 65	12-V2-L-G-S22	2240 36.7	2000	NA	100/130

France

Make	Model	Type	Displacement	T.O.	Rated H.P.	Fuel Grade
			Cu. in. Liters	H.P.	and Rated Altitude	
Béarn	6D	6-L1-A-G-S1	653 10.7	375	350/6,500 ft. (2 000 m)	87
*Gnome-Rhone	14M-8	14-R2-A-G-S1	1159 19.0	750	680/7,000 ft. (2 100 m)	87
*Gnome-Rhone	14N-48	14-R2-A-G-S1	2360 38.7	1180	1060/12,800 ft. (3 900 m)	87
Gnome-Rhone	14N-50	14-R2-A-G-S2	2360 38.7	1400	1200/13,100 ft. (4 000 m)	92
*Gnome-Rhone	14R-4	14-R2-A-G-S2	2360 38.7	1590	1580/18,000 ft. (5 500 m)	92
*Gnome-Rhone	18R-1	18-R2-A-G-S2	3034 49.7	2200	2150/22,300 ft. (6 800 m)	92
Hispano-Suiza	14AA	14-R2-A-D-S1	2758 45.2	1080	1150/13,100 ft. (4 000 m)	87
Hispano-Suiza	14AB	14-R2-A-D-S1	1593 26.1	700	750/13,100 ft. (4 000 m)	87
Hispano-Suiza	12X-12	12-V2-L-G-S1	1648 27.0	740	890/12,800 ft. (3 900 m)	87
*Hispano-Suiza	12Y-50	12-V2-L-G-S1	2197 36.0	1100	1000/10,800 ft. (3 300 m)	87
*Hispano-Suiza	12Z	12-V2-L-G-S1	2197 36.0	1300	1200/13,100 ft. (4 000 m)	92
Hispano-Suiza	24Y-90	24-H4-L-G-S1	4394 72.0	2200	2000/10,800 ft. (3 300 m)	87
Mathis	42B	42-R7-L-G-S2	3910 64.1	2800	NA	92
*Renault	4P-ei	4-L1-A-D-NS	384 6.3	150	140/sea level	80
*Renault	6Q-04	6-L1-A-D-S1	580 9.5	240	220/14,100 ft. (4 300 m)	80
*Renault	12R-00	12-A2-A-D-S1	1159 19.0	500	450/13,100 ft. (4 000 m)	87

*This engine is illustrated and described in complete detail in the standardized data section of this book.

†This engine is not active, January, 1945.

Australia

Make	Model	Type	Displacement Cu. in. Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Commonwealth Aircraft	R-1340 S1H1-G	9-R1-A-G-S1	1344 22,0	600	550/5,000 ft. (1 500 m)	91/96
*Commonwealth Aircraft	R-1830 S1C3-G	14-R2-A-G-S1	1830 30,0	1200	1200/3,700 ft. (1 100 m)	91/96
*General Motors-Holdens	Gipsy Major I	4-L1-A-D-NS	374 6,1	132	122/sea level	73

Germany

Make	Model	Type	Displacement Cu. in. Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Argus	As 10-C3	8-A2-A-D-NS	775 12,7	240	220/sea level	80
*Argus	As 410-A1	12-A2-A-G-S1	732 12,0	450	360/9,800 ft. (3 000 m)	87
Argus	As 411	12-A2-A-G-S1	732 12,0	500	450/13,100 ft. (4 000 m)	92
*B.M.W.	132-K	9-R1-A-G-S1	1690 27,7	1000	960/9,800 ft. (3 000 m)	87
*B.M.W.	801-D1	14-R2-A-G-S2	2550 41,8	1700	1600/19,800 ft. (6 000 m)	92
B.M.W.	802	18-R2-A-G-S2	3289 53,6	2000	2200/18,000 ft. (5 500 m)	92
Bramo	Sh 14A-4	7-R1-A-D-NS	470 7,7	160	145/sea level	80
*Bramo	Fafnir 323P-1	9-R1-A-G-S2	1836 26,8	985	775/13,900 ft. (4 200 m)	87
*Daimler-Benz	DB 601-E	12-A2-L-G-SV1	2069 33,9	1375	1375/18,000 ft. (5 500 m)	92
Daimler-Benz	DB 601-F1	12-A2-L-G-SV1	2069 33,9	1395	1400/19,700 ft. (6 000 m)	92
Daimler-Benz	DB 601-N	12-A2-L-G-SV1	2069 33,9	1200	1270/16,400 ft. (5 000 m)	92
*Daimler-Benz	DB 603-A	12-A2-L-G-SV1	2720 44,5	1800	1680/18,000 ft. (5 500 m)	92
*Daimler-Benz	DB 605-A1	12-A2-L-G-SV1	2180 35,7	1500	1350/19,700 ft. (6 000 m)	92
Daimler-Benz	DB 606	24-A4-L-G-SV1	4138 67,8	2400	2400/16,400 ft. (5 000 m)	92
Daimler-Benz	DB 610	24-A4-L-G-SV1	4360 71,4	2700	2600/19,000 ft. (5 800 m)	92
Hirth	HM 60-R2	4-L1-A-D-NS	220 3,6	80	72/sea level	73
*Hirth	HM 5C4-A2	4-L1-A-D-NS	238 4,0	105	95/sea level	80
*Hirth	HM 506-A1	6-L1-A-D-NS	360 5,9	160	145/sea level	80
*Hirth	HM 508-D	8-A2-A-G-S1	482 8,0	280	280/1,600 ft. (500 m)	80
*Hirth	HM 512-B	12-A2-A-G-S1	732 12,0	450	360/9,800 ft. (3 000 m)	87
Hirth	HM 515	4-L1-A-D-NS	177 3,0	65	60/sea level	80
*Junkers	Jumo 205-Ea	12-L1-L-G-S1	1014 18,6	700	650/8,200 ft. (2 500 m)	DF
*Junkers	Jumo 206	12-L1-L-G-S1	1556 25,5	1200	1000/9,800 ft. (3 000 m)	DF
*Junkers	Jumo 207-A	12-L1-L-G-S1T	1014 18,6	1000	1000/32,800 ft. (10 000 m)	DF
Junkers	Jumo 208	12-L1-L-G-S1T	1556 25,5	1500	1500/26,000 ft. (8 000 m)	DF
Junkers	Jumo 210-G	12-A2-L-G-S2	1202 19,7	700	675/12,500 ft. (3 800 m)	87
*Junkers	Jumo 211-J	12-A2-L-G-S2	2136 35,0	1350	1260/16,400 ft. (5 000 m)	92
*Junkers	Jumo 213-A	12-A2-L-G-S2	2250 38,9	1700	1500/19,800 ft. (6 000 m)	92
Zündapp	Z 909-2AO	4-L1-A-D-NS	122 2,0	55	50/sea level	73

Italy

Make	Model	Type	Displacement Cu. in. Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Alfa Romeo	Alfa 110-1	4-L1-A-D-NS	374 6,1	130	120/sea level	73
*Alfa Romeo	Alfa 115-1	6-L1-A-D-NS	560 9,2	205	195/sea level	73
Alfa Romeo	Alfa 126-RC34	9-R1-A-G-S1	1746 28,6	780	780/11,500 ft. (3 500 m)	87
*Alfa Romeo	Alfa 128-RC21	9-R1-A-G-S1	1746 28,6	950	860/6,900 ft. (2 100 m)	87
*Alfa Romeo	Alfa 135-RC32	14-R2-A-G-S1	2940 48,2	1620	1400/10,500 ft. (3 200 m)	87
C.N.A.	D-4	4-O2-A-D-NS	183 3,0	60	60/sea level	73
*Fiat	A74-RC38	14-R2-A-G-S1	1904 31,2	880	840/12,500 ft. (3 800 m)	87
*Fiat	A80-RC41	18-R2-A-G-S1	2759 45,7	1030	1000/13,500 ft. (4 100 m)	87
*Fiat	A82-RC42	18-R2-A-G-S1	2873 47,1	1400	1250/13,800 ft. (4 200 m)	87
*Isotta Fraschini	Beta	6-L1-A-G-S1	585 9,6	300	270/4,600 ft. (1 400 m)	87
Isotta Fraschini	Gamma RC35-IDS	12-A2-A-G-S1	1171 18,2	550	550/13,100 ft. (4 000 m)	87
*Isotta Fraschini	Delta RC35-IDS	12-A2-A-G-S1	1630 26,7	770	750/13,100 ft. (4 000 m)	87
*Piaggio	P.VII-C35	7-R1-A-D-S1	1177 19,3	500	460/11,500 ft. (3 500 m)	87
*Piaggio	P.X-RC35	9-R1-A-G-S1	1519 24,9	650	825/11,500 ft. (3 500 m)	87
*Piaggio	P.XI-RC40	14-R2-A-G-S1	2356 38,6	1000	1000/13,100 ft. (4 000 m)	87
*Piaggio	P.XII-RC35	18-R2-A-G-S1	3234 53,0	1500	1350/11,500 ft. (3 500 m)	87
Piaggio	P.XVI-RC35	9-R1-A-G-S1	1519 24,9	700	870/11,500 ft. (3 500 m)	87
Piaggio	P.XXII-RC35D	18-R2-A-G-S1	3691 60,5	1700	1600/11,500 ft. (3 500 m)	87

*This engine is illustrated and described in complete detail in the standardized data.

Japan

Make	Model	Type	Displacement Cu. in. / Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Aichi	Atsuta 21	12-A2-L-G-SV1	2069 33,9	1200	1100/13,500 ft. (4 100 m)	92
Hitachi	Amakaze 11	9-R1-A-D-NS	1090 17,9	340	300/sea level	80
Hitachi	Hatsukaze	5-R1-A-D-NS	372 6,1	100	90/sea level	73
Hitachi	Kamikaze	7-R1-A-D-NS	530 8,7	140	130/sea level	80
Kawasaki	Type 2	12-A2-L-G-SV1	2069 33,9	1200	1100/13,500 ft. (4 100 m)	92
Mitsubishi	Kasei 11, 15	14-R2-A-G-S2	2570 42,1	1500	1350/13,100 ft. (4 000 m)	92
Mitsubishi	Kasei 21, 22, 25	14-R2-A-G-S2	2570 42,1	1800	1500/16,400 ft. (5 000 m)	92
Mitsubishi	Kinsei 43	14-R2-A-G-S1	1971 32,3	1050	1060/6,600 ft. (2 000 m)	87
*Mitsubishi	Kinsei 44	14-R2-A-G-S1	1971 32,3	1000	1075/13,100 ft. (4 000 m)	92
Mitsubishi	Kinsei 45, 46	14-R2-A-G-S1	1971 32,3	1000	1050/14,100 ft. (4 300 m)	92
Mitsubishi	Miozio	9-R1-A-G-S1	1890 27,7	800	750/13,100 ft. (4 000 m)	87
Mitsubishi	Type 1	14-R2-A-G-S2	2570 42,1	1100	1100/10,000 ft. (3 000 m)	92
Mitsubishi	Zuisei 13	14-R2-A-G-S1	1709 28,0	850	860/13,100 ft. (4 000 m)	92
Nakajima	Hikari I	9-R1-A-G-S1	1820 29,9	800	800/13,100 ft. (4 000 m)	87
Nakajima	Hikari II	9-R1-A-G-S2	1820 29,9	1000	880/16,400 ft. (5 000 m)	92
Nakajima	Homare 11	18-R2-A-G-S2	2185 35,8	1800	1500/13,100 ft. (4 000 m)	92
Nakajima	Homare 21	18-R2-A-G-S2	2185 35,8	1800	1600/16,400 ft. (5 000 m)	92
Nakajima	Kotubuki II	9-R1-A-G-S1	1470 24,1	500	450/12,000 ft. (3 600 m)	87
Nakajima	Kotubuki III	9-R1-A-G-S1	1470 24,1	610	680/12,000 ft. (3 000 m)	87
Nakajima	Sakae 11	14-R2-A-G-S1	1700 27,8	980	950/10,000 ft. (3 000 m)	87
Nakajima	Sakae 12	14-R2-A-G-S1	1700 27,8	1000	900/13,100 ft. (4 000 m)	92
*Nakajima	Sakae 21, 22	14-R2-A-G-S2	1700 27,8	1150	950/19,700 ft. (6 000 m)	92
Nakajima	Type 1	14-R2-A-G-S1	1700 27,8	900	900/12,000 ft. (3 600 m)	87
Nakajima	Type 2	14-R2-A-G-S2	2185 35,8	1400	1300/16,400 ft. (5 000 m)	92

U.S.S.R.

Make	Type	Displacement Cu. in. / Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
M-11	5-R1-A-D-NS	518 8,5	100	100/sea level	73
M-11G	5-R1-A-G-NS	518 8,5	130	130/sea level	73
M-15	9-R1-A-D-S1	1753 28,7	415	490/12,000 ft. (3 600 m)	87
M-17	12-V2-L-D-NS	2864 46,9	680	680/sea level	87
M-26	7-R1-A-D-GB	756 12,4	300	300/sea level	87
AM-35	12-V2-L-G-S2	2800 45,9	1200	1100/13,100 ft. (4 000 m)	87
AM-35A	12-V2-L-G-S2	2800 45,9	1350	1000/16,400 ft. (5 000 m)	95
*AM-38A	12-V2-L-G-S2	2800 45,9	1600	1400/19,700 ft. (6 000 m)	95
AM-38B	12-V2-L-G-S1	2800 45,9	1800	1500/6,600 ft. (2 000 m)	95
M-64	9-R1-A-G-S2	1823 29,9	1000	1000/13,100 ft. (4 000 m)	95
M-82	14-R2-A-G-S2	2603 42,7	1600	1300/13,100 ft. (4 000 m)	95
M-85	14-R2-A-G-S1	2360 38,7	1000	1000/13,100 ft. (4 000 m)	87
M-87B	14-R2-A-G-S2	2360 38,7	1100	1000/13,100 ft. (4 000 m)	95
*M-88	14-R2-A-G-S2	2360 38,7	1100	1000/13,100 ft. (4 000 m)	95
M-103	12-V2-L-G-S1	2197 36,0	1000	950/11,800 ft. (3 600 m)	95
*M-105P	12-V2-L-G-S2	2197 36,0	1100	1050/13,100 ft. (4 000 m)	95
M-105R	12-V2-L-G-S2	2197 36,0	1100	1050/13,100 ft. (4 000 m)	95
M-107	12-V2-L-G-S2	2197 36,0	1200	1100/16,400 ft. (5 000 m)	95

Airborne Auxiliary Power Plants

Country	Make	Model	UNIT		ENGINE		GENERATOR	
			Type	H.P.	Type	Continuous Output		
United States	Andover	V-32	2-V2-A-G-NS	10.0	Aircraft	5.0 kw. 28.5 v. D.C.		
United States	Eclipse	NEG-1	1-L1-A-D-NS	4.0	Eclipse	3.0 kw. 28.5 v. D.C., or 3.0 kw. 120 v. A.C.		
United States	Lawrance	30C-1	2-02-A-D-NS	10.0	Aircraft	5.0 kw. 28.5 v. D.C.		
United States	Lawrance	30D-1	2-02-A-D-NS	10.0	Aircraft	5.0 kw. 28.5 v. D.C.		
United States	Onan	1C-68S	1-L1-A-D-NS	1.1	Onan	0.6 kw. 24.0 v. D.C.		
United States	Onan	OTC-80E	2-02-A-D-NS	4.0	Onan	2.0 kw. 28.5 v. D.C.		
United States	Onan	OFA-90	4-02-A-G-NS	11.7	Aircraft	5.0 kw. 28.5 v. D.C.		
Great Britain	Rotol	P-6	6-02-A-D-NS	60.0	Rotol	3.5 kw. 29.0 v. D.C. and 20.0 kw. 110 v. A.C.		

*This engine is illustrated and described in complete detail in the standardized data section of this book.

(This unit is illustrated and described in complete detail in the Airborne Auxiliary Power Plants section of this book.

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